

SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE
OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION
FOR THE ADVANCEMENT OF SCIENCE.

EDITORIAL COMMITTEE: S. NEWCOMB, Mathematics; R. S. WOODWARD, Mechanics; E. C. PICKERING, Astronomy; T. C. MENDENHALL, Physics; R. H. THURSTON, Engineering; IRA REMSEN, Chemistry; CHARLES D. WALCOTT, Geology; W. M. DAVIS, Physiography; HENRY F. OSBORN, Paleontology; W. K. BROOKS, C. HART MERRIAM, Zoology; S. H. SCUDDER, Entomology; C. E. BESSEY, N. L. BRITTON, Botany; C. S. MINOT, Embryology, Histology; H. P. ROWDITCH, Physiology; J. S. BILLINGS, Hygiene; WILLIAM H. WELCH, Pathology; J. McKEEN CATTELL, Psychology.

FRIDAY, JANUARY 30, 1903.

CONTENT:

<i>Carnegie Institution of Washington</i>	161
<i>The American Association for the Advancement of Science:—</i>	
Section B, Physics: PROFESSOR DAYTON C. MILLER	170
<i>Meeting of the American Physical Society: ERNEST MERRITT</i>	180
<i>Scientific Books:—</i>	
<i>Blatchley's A Nature Wooing at Ormond by the Sea</i> : PROFESSOR C. H. HITCHCOCK..	184
<i>Scientific Journals and Articles</i>	185
<i>Societies and Academies:—</i>	
<i>The Entomological Society of Washington</i> : ROLLA P. CURRIE. <i>The Geological Society of Washington</i> : ALFRED H. BROOKS. <i>The New York Academy of Sciences: Section of Anthropology and Psychology</i> : PROFESSOR JAMES E. LOUGH. <i>The Academy of Science of St. Louis</i> : PROFESSOR WILLIAM TRELEASE. <i>The Toronto Astronomical Society</i> : J. R. COLLINS	185
<i>Discussion and Correspondence:—</i>	
<i>Guesses on the Relative Weights of Bills and Coins</i> : PROFESSOR E. E. SLOSSON. <i>The Publication of Rejected Names</i> : PROFESSOR T. D. A. COCKERELL. <i>The Iroquois Book of Rites</i> : DR. W. M. BEAUCHAMP.....	189
<i>Shorter Articles:—</i>	
<i>The Tortugas, Florida, as a Station for Research in Biology</i> : DR. ALFRED GOLDSBOROUGH MAYER. <i>Egg-laying in Gonionemus</i> : L. MURBACH. <i>Miley's Process of Color Photography</i> : PROFESSOR JAS. LEWIS HOWE	190
<i>Current Notes on Physiography:—</i>	
<i>Physiographic Divisions of Kansas; The Alps in the Ice Age; Glaciers as Conservative Agents</i> : PROFESSOR W. M. DAVIS....	193
<i>The Missouri Botanical Garden</i>	195
<i>Scientific Notes and News</i>	196
<i>University and Educational News</i>	200

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

CARNEGIE INSTITUTION OF WASHINGTON.*

MEETING OF INCORPORATORS OF THE CARNEGIE INSTITUTION OF WASHINGTON.

THE meeting of the Incorporators of the Carnegie Institution was held at the office of the Secretary of State, Washington, D. C., January 4, 1902, at 10 o'clock A.M.

Present: Hon. John Hay, Secretary of State, Justice Edward D. White, Dr. Daniel C. Gilman, Dr. John S. Billings, Hon. Carroll D. Wright and Dr. Charles D. Walcott. Mr. Hay was chosen chairman of the meeting and Mr. Walcott secretary.

On receipt of notice of the filing of the Articles of Incorporation, Mr. White moved that the incorporators proceed to ballot for trustees. This was done, and the following persons were unanimously elected:

Ex Officio. The President of the United States; the President of the Senate; the Speaker of the House of Representatives; the Secretary of the Smithsonian Institution; the President of the National Academy of Sciences.

Grover Cleveland, New Jersey; John S. Billings, New York; William N. Frew, Pennsylvania; Lyman J. Gage, Illinois; Daniel C. Gilman, Maryland; John Hay, District of Columbia; Abram S. Hewitt, New Jersey; Henry L. Higginson, Massachusetts; Henry Hitchcock, Missouri; Charles L. Hutchinson, Illinois; William Lindsay, Kentucky; Seth Low, New York; Wayne MacVeagh, Pennsylvania; D. O. Mills, New York; S. Weir Mitchell, Pennsylvania; William W. Morrow, California;

* Abstracts from the Year Book, No. 1, 1902.

Elihu Root, New York; John C. Spooner, Wisconsin; Charles D. Walcott, District of Columbia; Andrew D. White, New York; Edward D. White, Louisiana; Carroll D. Wright, District of Columbia.

FIRST MEETING OF BOARD OF TRUSTEES.

The Trustees assembled in the Diplomatic Room, Department of State, Washington, D. C., Wednesday, January 29, 1902, at half past two. They were called to order by Hon. Abram S. Hewitt, who nominated for temporary chairman Hon. John Hay, who was unanimously elected and took the chair. Mr. Hewitt then nominated Dr. Charles D. Walcott as temporary secretary, and he was unanimously elected.

The secretary then read the minutes of the meeting of the incorporators and presented the Articles of Incorporation, after which Mr. Andrew Carnegie was introduced by the chairman, and made the remarks which have been printed.

The following resolution was presented and unanimously adopted:

"In addition to the personal and individual expressions extended to Mr. Carnegie for what he has done for the world to-day:

Resolved, That the chairman of this meeting be requested to draft a letter addressed to Mr. Carnegie expressing the views of the Trustees concerning this magnificent gift and the purposes for which it is to be applied as set forth in the letter and other documents which have just been read."

Attention was called to the vacancy on the Board caused by the declination of Hon. Grover Cleveland, who had not found it possible to accept a place on the Board on account of his health. The Board balloted for a trustee to fill a vacancy thus arising, and Mr. William E. Dodge, of New York, was unanimously elected.

A proposed code of by-laws was then presented, discussed, amended and adopted.

Election of officers was then held with the following result:

Chairman of the Board of Trustees—Abram S. Hewitt.

Vice-Chairman of the Board of Trustees—John S. Billings.

Secretary of the Board of Trustees—Charles D. Walcott.

President of Carnegie Institution—Daniel C. Gilman.

Relative to the acceptance of the trust created by Mr. Carnegie, it was

Resolved: That the Board of Trustees, acknowledging the generosity of the gift of Mr. Carnegie, in the foundation of the Institution, desire to express the concurrence of the Trustees in the scope and purpose stated in his deed of trust, and hereby formally accept the donation and the responsibilities connected with it.

It was also voted that the resolution just adopted be forwarded to Secretary Hay, to be by him sent to Mr. Carnegie, with a letter expressing the views of the Trustees on the gift. Mr. Hay subsequently transmitted the resolution and with it the following letter:

DEPARTMENT OF STATE,

WASHINGTON, March 7, 1902.

HON. ANDREW CARNEGIE,

5 West 51st Street, New York City.

SIR: The Trustees of the Carnegie Institution, which you have recently founded in the city of Washington, formally accepted your gift, by the adoption of the appended Resolution.

At the same time they requested me, as the presiding officer at the first meeting of the Board, to convey to you by a letter an expression of their hearty appreciation of your munificence, and also their admiration of the noble purpose and the liberal spirit which distinguish your foundation.

For the advancement of knowledge and the education of youth, there are already in this country many strong institutions, learned societies, universities, government bureaus, libraries and museums. With all of them the Carnegie Institution can cooperate, while it has a field of its own, carefully indicated in your deed of gift, and more fully explained by the remarks which you addressed to the Board.

Every one of those whom you have chosen as Trustees will regard it as a sacred duty and a pleasure, to uphold the lofty ideal that you have set before them, and to impart to those who come

afterwards the spirit of confidence and enthusiasm with which the work has begun.

I am, Sir,

Very respectfully yours,

JOHN HAY.

Dr. Gilman, the elected President, then addressed the Board, explaining, so far as they were known to him, the circumstances which preceded the incorporation of the Carnegie Institution. His remarks were extemporaneous and intended to acquaint the Board with his attitude and that of the gentlemen with whom, at Mr. Carnegie's request, he had been associated in these arrangements which preceded the meeting of the Board. He expressed his appreciation of the honor conferred upon him by his selection as President of the Institution, and he indicated in broad outlines the probable methods of procedure. At an early day experts in many branches of science will be selected by the executive committee to whom all applications for encouragement and aid will be referred. These experts will be requested to add their own suggestions, and present their recommendations in writing. Meanwhile, the executive committee will gather information in respect to endowments and establishments for promoting science, at home and abroad, in order that this experience may be at the service of the Trustees, and that there may be cooperation, and not conflict, with other institutions in any plans that may be adopted.

After discussing nominations the following named persons were elected members of the executive committee: John S. Billings, Daniel C. Gilman, Abram S. Hewitt, S. Weir Mitchell, Elihu Root, Charles D. Walcott, Carroll D. Wright.

The following resolutions were then considered and adopted:

Resolved: That the Executive Committee is requested to prepare a report upon the work which should be undertaken by the Carnegie Institution

in the near future, such report to be submitted to the Board of Trustees at its next meeting, and to be accompanied with estimates for expenditures required.

Resolved: That the Executive Committee, when they shall have formulated plans of the work which should be undertaken by the Carnegie Institution, shall have the same printed and a copy forwarded to each Trustee prior to the annual meeting in November, 1902.

Resolved: That the Executive Committee is requested to consider the question of a proper administration building for the Carnegie Institution, to be located in Washington, including both a proper site and plans for the same.

SECOND MEETING OF THE BOARD OF TRUSTEES.

The meeting was held in Washington, at the New Willard Hotel, on Tuesday, November 25, 1902, at 10 A.M.

The President of the Institution, Mr. Gilman, made a general statement of the work of the executive committee and referred to the report of the committee, which had been printed and distributed to the Trustees in advance of the meeting.

The Secretary made a brief report, referring principally to the financial transactions of the Institution.

Consideration of the executive committee's report was then taken up, and a long discussion followed on the various recommendations made by the committee.

At the second session the Board resumed its discussion of policy and the recommendations of the executive committee, especially the purchasing of a site. As the outcome a motion to postpone till the next annual meeting the decision on the question of site was made and carried.

The Board then considered and adopted the following resolution:

Resolved: That from the available income of the Institution \$50,000 is hereby appropriated for administrative expenses, \$200,000 for grants for research during the fiscal year 1902-'03, \$40,000 for a publication fund, the expenditures to be made under the direction of the Executive Committee, and that \$100,000 of the available income

of the Institution be set apart for a reserve fund during the fiscal year 1902-'03.

Amendments to the by-laws were then considered, and the date of the annual meeting was changed from November to the second Tuesday of December, beginning with the year 1903. By-laws were also adopted providing that the fiscal year of the Institution shall be from November first to October thirty-first, inclusive, and that there shall be a finance committee consisting of three members of the Board, to be elected by the Board and to hold office until their successors are elected. The duty of such finance committee shall be to consider and recommend to the Board of Trustees such measures as it may believe will promote the financial interests of the Institution. The Board then proceeded to the choice of the finance committee, and elected Messrs. Gage, Mills and Higginson.

The following minute relative to the death of Mr. Henry Hitchcock was presented by Mr. Higginson and adopted by the Board:

The death of Mr. Henry Hitchcock has deprived this Board of Trustees of a cultured and wise counsellor, a progressive leader, and a valued associate. Mr. Hitchcock stood for all that was noble in manhood and the development of man. His every effort was to serve any cause with which he was connected with all the power and ability he possessed. We tender to the members of his bereaved family sincere sympathy, and place this resolution in our minutes as a permanent record of our appreciation and esteem.

The Board then proceeded to fill the vacancy caused by the death of Mr. Hitchcock. Mr. Ethan Allen Hitchcock was nominated and unanimously elected.

PROCEEDINGS OF EXECUTIVE COMMITTEE.

Organization.—At its first meeting the committee organized by electing Mr. Gilman chairman and Mr. Walcott secretary. At the same time lots were drawn for the terms of service of members, three to expire with the annual meeting in 1903, two

in 1904 and two in 1905. The result of the drawing was as follows:

Terms expiring in December,

1903, Gilman, Mitchell, Wright; 1904, Billings, Walcott; 1905, Hewitt, Root.

Advisory Committees.—As soon as it was organized the executive committee, in compliance with the instructions of the Trustees, began an investigation to determine what work should be entered upon, in the immediate future, by the Institution. Its first step consisted in the appointment of advisory committees. Eighteen such committees were appointed, as follows:

Anthropology: William H. Holmes, Chief, Bureau of American Ethnology, and Head Curator, Department of Anthropology, U. S. National Museum, Washington, D. C., *Chairman*; Franz Boas, Curator, Department of Anthropology, American Museum of Natural History, New York, N. Y.; George A. Dorsey, Field Columbian Museum, Chicago, Ill.

Astronomy: E. C. Pickering, Professor of Astronomy and Director of Harvard Observatory, Cambridge, Mass., *Chairman*; Lewis Boss, Director of Dudley Observatory, Albany, N. Y.; George E. Hale, Director of Yerkes Observatory, Williams Bay, Wis.; S. P. Langley, Secretary Smithsonian Institution, Washington, D. C.; Simon Newcomb, late Superintendent of Nautical Almanac, Washington, D. C.

Bibliography: Herbert Putnam, Librarian of Congress, Washington, D. C., *Chairman*; Cyrus Adler, Librarian, Smithsonian Institution, Washington, D. C.; J. S. Billings, Director New York Public Library, New York, N. Y.

Botany: Frederick V. Coville, Botanist, Department of Agriculture, Washington, D. C., *Chairman*; N. L. Britton, Superintendent, New York Botanical Garden, New York, N. Y.; John M. Macfarlane, Professor of Botany, University of Pennsylvania, Philadelphia, Pa.; Gifford Pinchot, Forester, U. S. Department of Agriculture, Washington, D. C.

Chemistry: Ira Remsen, Professor of Chemistry and President of Johns Hopkins University, Baltimore, Md., *Chairman*; T. W. Richards, Professor of Chemistry, Harvard University, Cambridge, Mass.; Edgar F. Smith, Professor of Chemistry, University of Pennsylvania, Philadelphia, Pa.

Economics: Carroll D. Wright, Commissioner of Labor, Washington, D. C., *Chairman*; Henry W. Farnam, Professor of Political Economy, Yale University, New Haven, Conn.; John B. Clark, Professor of Political Economy, Columbia University, New York, N. Y.

Engineering: R. H. Thurston, Director of Sibley College, Cornell University, Ithaca, N. Y., *Chairman*; William H. Burr, Professor of Civil Engineering, Columbia University, New York, N. Y.; George Gibbs, Consulting Engineer, Baldwin Locomotive Works, Philadelphia, Pa.; George S. Morison, Civil Engineer, 49 Wall Street, New York, N. Y.; Charles P. Steinmetz, Electrician, General Electric Co., Schenectady, N. Y.

Geography: William M. Davis, Professor of Geology, Harvard University, Cambridge, Mass.

Geophysics: [Joint Committee on Geology and Physics.]

Geology: T. C. Chamberlin, Head of Geological Department and Director of Museum, University of Chicago, Chicago, Ill., *Chairman*; Charles R. Van Hise, Professor of Geology, University of Wisconsin, Madison, Wis.; Charles D. Walcott, Director of U. S. Geological Survey, Washington, D. C.

History: J. Franklin Jameson, Head of Department of History, University of Chicago, Chicago, Ill., *Chairman*; Charles Francis Adams, Boston, Mass.; Andrew C. McLaughlin, Professor of American History, University of Michigan, Ann Arbor, Mich.

Mathematics: E. H. Moore, Head Professor of Mathematics, University of Chicago, Chicago, Ill., *Chairman*; Frank Morley, Professor of Mathematics, Johns Hopkins University, Baltimore, Md.; Ormond Stone, Professor of Astronomy and Director of Leander McCormick Observatory, Charlottesville, Va.

Meteorology: Cleveland Abbe, Professor of Meteorology, U. S. Weather Bureau, Washington, D. C.

Paleontology: Henry F. Osborn, DaCosta Professor of Zoology, Columbia University, New York, N. Y., *Chairman*; Henry S. Williams, Professor of Geology, Yale University, New Haven, Conn.

Physics: R. S. Woodward, Dean of School of Pure Science and Professor of Mechanics and Mathematical Physics, Columbia University, New York, N. Y., *Chairman*; Carl Barus, Professor of Physics, Brown University, Providence, R. I.; A. A. Michelson, Head Professor of Physics, University of Chicago, Chicago, Ill.

Physiology (including Toxicology): S. Weir Mitchell, Philadelphia, Pa., *Chairman*; H. P.

Bowditch, Professor of Physiology, Harvard Medical School, Cambridge, Mass.; William H. Howell, Dean of Johns Hopkins Medical School, Baltimore, Md.

Psychology: J. Mark Baldwin, Professor of Psychology, Princeton University, Princeton, N. J.

Zoology: Henry F. Osborn, DaCosta Professor of Zoology, Columbia University, New York, N. Y., *Chairman*; Alex. Agassiz, Curator Natural History Museum, Cambridge, Mass.; W. K. Brooks, Professor of Zoology, Johns Hopkins University, Baltimore, Md.; C. Hart Merriam, Chief U. S. Biological Survey, Washington, D. C.; E. B. Wilson, Professor of Zoology, Columbia University, New York, N. Y.

These advisers were requested to give the committee their views on various important suggestions received by the Institution, as well as independent recommendations originating in the committees. The following is a copy of the letter appointing the advisers and inviting suggestions and recommendations:

MARCH 11, 1902.

DEAR SIR:

The Executive Committee of the Carnegie Institution have been requested by the Trustees to prepare, in the course of the Summer, a plan of procedure, and in the meantime to engage in preliminary studies of the problems committed to them, by consultation with acknowledged authorities at home and abroad.

The plan of the Institution includes the appointment from time to time of counsellors, or advisers, to whom the Committee may refer important suggestions, and from whom they may receive independent recommendations. You are invited to act as one of these advisers until the annual meeting of the Trustees, in November next. It is the purpose of the Institution to provide liberally for any expense that may be incurred in clerical service and in travel by those whom they may consult. If it is agreeable to you to accept this invitation, a more personal communication will be addressed to you at an early day. An immediate answer is requested.

Respectfully,

D. C. GILMAN,
President.

The reports received from the advisory committees, as far as they relate to scope and plan are printed in Appendix A.

A circular letter was also prepared and sent to nearly a thousand scientific men and investigators of prominence, mainly in the United States. This was accompanied by a pamphlet that included the articles of incorporation, the founder's address, and a list of the officers. The circular letter is as follows:

Letter to the Heads of American Institutions and to Others Interested in the Work of Investigation.

The Carnegie Institution sends to you herewith a copy of Mr. Carnegie's deed of gift and other information in respect to the organization of the new foundation.

Some of the ablest thinkers and investigators in the country have already called attention to important lines of inquiry. Their communications will be referred to special committees in different departments of knowledge—astronomical, physical, chemical, biological, geological, archaeological, philological, historical, bibliographical, economical, etc.—and the referees will be requested to add their own suggestions and to report to the Carnegie Institution such methods of procedure and the names of such investigators as they deem likely to advance with wisdom the great purpose of the foundation.

No large appropriations can be made at present, as there will be no income from the fund before August. The summer will be chiefly devoted to a careful study of the problems of scientific investigation, at home and abroad, and in the autumn definite plans of procedure will be formulated.

Any member of the Executive Committee will be glad to receive from you at any time suggestions, opinions, and advice as to fields that the Carnegie Institution ought to occupy and the best methods for carrying forward its work in those fields; but in order that important papers designed for official consideration may be properly recorded and filed, they should be addressed to the President of the Carnegie Institution, 1439 K street, Washington, D. C.

DANIEL C. GILMAN, *Chairman*,
CHARLES D. WALCOTT, *Secretary*,
JOHN S. BILLINGS,
ABRAM S. HEWITT,
S. WEIR MITCHELL,
ELIHU ROOT,
CARROLL D. WRIGHT,

March, 1902.

Executive Committee.

For its guidance, the committee has formulated and adopted the following statements as to its purposes, principles, organization and policy:

Purposes.—In connection with the determination of the policy of the Institution, it is necessary to clearly define its purposes and to adopt some general plan for organization and administration. The purposes are declared by the founder to be

"To found in the city of Washington an institution which, with the cooperation of institutions now or hereafter established, there or elsewhere, shall in the broadest and most liberal manner encourage investigation, research and discovery—show the application of knowledge to the improvement of mankind, provide such buildings, laboratories, books and apparatus as may be needed, and afford instruction of an advanced character to students properly qualified to profit thereby."

And he adds:

"That his chief purpose is to secure, if possible, for the United States of America leadership in the domain of discovery and the utilization of new forces for the benefit of man."

The trust deed enumerates several aims, all of which may be grouped under two heads, viz:

(A) To promote original research.

(B) To increase facilities for higher education.

Under (A) may be grouped:

(a) The promotion of original research 'as one of the most important of all subjects.'

(b) To discover the exceptional man * * * and enable him to make the work for which he seems specially designed his life work.

(c) The prompt publication and distribution of the results of scientific investigation.

Under (B) may be grouped:

(a and b) The increase of facilities for higher education by increasing the efficiency of the universities and other institutions, either by utilizing and adding to their existing facilities or by aid-

ing teachers in various institutions in experimental and other work.

(c) To enable such students as may find Washington the best point for their special studies to take advantage of the facilities there for higher education and research.

Principles.—It is the judgment of the executive committee that the aims enumerated can be best carried into effect under the following principles, which are to be departed from only in very exceptional cases.

The Institution proposes to undertake—

(A) To promote original research by systematically sustaining—

(a) Projects of broad scope that may lead to the discovery and utilization of new forces for the benefit of man, pursuing each with the greatest possible thoroughness.

(b) Projects of minor scope that may fill in gaps in knowledge of particular things or restricted fields of research.

(c) Administration of a definite or stated research under a single direction by competent individuals.

(d) Appointment of Research Assistants.

(B) To increase facilities for higher education by promoting—

(a) Original research in universities and institutions of learning by such means as may be practicable and advisable.

(b) The use by advanced students of the opportunities offered for special study and research by the Government bureaus in Washington.

The Institution does not propose to undertake—

(a) To do anything that is being well done by other agencies.

(b) To do that which can be better done by other agencies.

(c) To enter the field of existing organizations that are properly equipped or are likely to be so equipped.

(d) To give aid to individuals or other organizations in order to relieve them of financial responsibilities which they are able to carry, or in order that they may divert funds to other purposes.

(e) To enter the field of applied science except in unusual cases.

(f) To purchase land or erect buildings for any organization.

(g) To aid institutions when it is practicable to accomplish the same result by aiding individuals who may or may not be connected with institutions.

(h) To provide for a general or liberal course of education.

Organization.—The executive committee, keenly realizing the importance of thoroughly investigating and fully considering every proposed action before recommending it to the Trustees, have given much time and thought to the subject of organization, and at the several meetings have discussed the suggestions received from individuals and from the advisory committees. It is hoped and expected that the Institution will set a high standard for research. This the committee believes can be best attained and maintained by establishing such laboratories and facilities, not found elsewhere, as are necessary when dealing with problems.

The committee is of the opinion that organization in Washington should be provided for by—

(a) Purchasing in the northwestern suburb of the city a tract of ground suitable for present and future needs.

(b) Erecting thereon a central administration building, to serve as the administrative headquarters of research work conducted, directed, or aided by the Carnegie Institution.

(c) Establishing such laboratories from time to time as may be deemed advisable.

(d) Employing the best qualified men that can be secured for carrying on such research work as it may be decided to undertake in Washington.

(e) Continuing and developing the present office organization as the Executive Committee may find it necessary to do in order to properly conduct the work of the Institution.

The only organization outside of Washington to be provided for at present should be such advisers and advisory committees as may from time to time be found necessary in connection with the development of the research work of the Institution.

It is the opinion of the committee that such persons and committees should be largely advisory and not executive in their function. Executive work should be in charge of paid employees of the Institution. These may be officers, research associates and special employees.

Policy.—Soon after the executive committee began its investigations it became evident that two lines of policy were open, namely:

(a) To sustain broad researches and extended explorations that will greatly add to knowledge.

(b) To make small grants.

Research may be defined as original investigation in any field, whether in science, literature or art. Its limits coincide with the limits of the knowable. In the field of research the function of the Institution should be organization, the substitution of organized for unorganized effort wherever such combination of effort promises the best results; and the prevention, as far as possible, of needless duplication of work. Hitherto, with few exceptions, research has been a matter of individual enterprise, each worker taking up the special problem which chance or taste led him to and treating it in his own way. No investigator, working single handed, can at present approach the largest problems in the broadest way thoroughly and systematically.

With an income large enough to enter upon some large projects and a number of minor ones, it appears to be wiser, at the beginning, to make a number of small grants and to thoroughly prepare to take up some of the larger projects. With this in view the executive committee recommended to the Trustees that there be placed at its disposal for the fiscal year 1902-'03, two hundred thousand dollars for aid to special researches in various branches of science, and \$40,000 for the publication of the results achieved. Dur-

ing the year plans will be perfected, data secured and experience gained that will be of great service in formulating recommendations for the ensuing year.

In the opinion of the committee, the most effective way to discover and develop the exceptional man is to put promising men upon research work under proper guidance and supervision. Those who do not fulfil their promise will soon drop out, and by the survival of the fittest the exceptionally capable man will appear and be given opportunity to accomplish the best that is in him. When the genius is discovered, provide him with the best equipment that can be obtained.

In making grants the wisest policy appears to be to make them to individuals for a specific purpose rather than to institutions for general purposes.

Grants.—Under the authority conferred upon it by the Trustees at their first meeting, the executive committee made three grants, as follows:

March 25, 1902. To the Marine Biological Laboratory, Woods Hole, Mass., for general support	\$4,000
April 15, 1902. To Dr. J. McK. Cattell, Columbia University, New York, for preparing a list of the scientific men of the United States	1,000
April 15, 1902. To Dr. Hideyo Noguchi and Professor Simon Flexner, Philadelphia, Pa., for continuation of their studies of the toxicological actions of snake venom and allied poisons	1,000
Total	\$6,000

Since the second meeting of the Trustees, on November 25, 1902, the executive committee has made the following grants in the several departments of science mentioned; anthropology, mathematics and other branches will be acted upon later:

Astronomy	\$ 21,000
Bibliography	15,000
Botany	11,700
Chemistry	3,000
Economics	15,000

Engineering	4,500
Exploration	5,000
Geology	12,000
Geophysics	8,500
History	5,000
Investigation of project for southern and solar observatory	5,000
Investigation of project for physical and geophysical laboratories	5,000
Investigation of natural history projects	5,000
Marine biological research	12,500
Paleontology	1,900
Physics	4,000
Physiology	5,000
Psychology	1,600
Publications	5,500
Research assistants	25,000
Student research work in Washington...	10,000
Zoology	4,000
Total	\$185,200

CHARLES D. WALCOTT,
Secretary.

SUMMARY.

As a convenient summary of the plans and methods thus far agreed upon the following minute is approved:

The methods of administration of the Carnegie Institution thus far developed are general rather than specific.

The encouragement of any branch of science comes within the possible scope of this foundation, but as the fund, munificent as it is, is inadequate to meet the requests for aid already presented, not to mention others which are foreseen though not yet formulated, attention has been concentrated upon a selection of those objects which, at this time and in our country, seem to require immediate assistance.

Efforts have been and will be made to secure cooperation with other agencies established for the advancement of knowledge, while care will be exercised to refrain from interference or rivalry with them. Accordingly, ground already occupied will be avoided. For example, if medical research is provided for by other agencies, as it appears to be, the Carnegie Institution will not enter that field. Systematic

education, abundantly provided for in this country by universities, colleges, professional schools, and schools of technology, will not be undertaken. Nor will the assistance of meritorious students in the early stages of their studies come within the scope of this foundation. Sites or buildings for other institutions will not be provided.

Specific grants have been and will be made, for definite purposes, to individual investigators, young or old, of marked ability, and for assistance, books, instruments, apparatus and materials. It is understood that such purchases are the property of the Carnegie Institution and subject to its control. The persons thus aided will be expected to report upon the methods followed and the results obtained. In the publication of results it is expected that the writer will say that he was aided by the Carnegie Institution of Washington, unless it be requested that this fact be not made known.

In order to carry out the founder's instructions in respect to bringing to Washington highly qualified persons who wish to profit by the opportunities for observation and research afforded by the various scientific bureaus of the United States Government, a certain sum is set apart for this purpose.

In addition, the Carnegie Institution will appoint from time to time a number of persons to be known as research assistants, who may or may not reside in Washington, and who shall undertake to carry on such special investigation as may be entrusted to them by the Institution. The appointments will be made for a year, and may be renewed in any case where it seems desirable. Permission may be given to go abroad, if special advantages not accessible in this country can thus be secured.

Publication is regarded by the founder as of special importance. Accordingly,

appropriations will be made for this purpose, especially for the printing of papers of acknowledged importance, so abstruse, so extended or so costly that without the aid of this fund they may not see the light.

With respect to certain large undertakings involving much expense, which have been or may be suggested, careful preliminary inquiries have been and will be made.

In order to secure the counsel of experts in various departments of knowledge, special advisers have been and will be invited from time to time for consultation. Valuable suggestions and counsel have already been received from such advisers.

DANIEL C. GILMAN,
*President of the Carnegie
Institution.*

WASHINGTON,
November 25, 1902.

AMERICAN ASSOCIATION FOR THE AD-
VANCEMENT OF SCIENCE.

SECTION B, PHYSICS.

THE sessions of Section B, in affiliation with the American Physical Society, at Washington, were very successful; the attendance was much larger than has been usual, and it was characterized by the presence of many leading physicists representing a wide territory. Forty-five papers of a high average quality were given; twenty-six of these were presented before Section B, and nineteen before the Physical Society. The number of papers would undoubtedly have been much larger had not this meeting followed so closely upon the Pittsburgh meeting. Nearly every paper drew forth some discussion, though it would seem that this feature of the sessions might be extended with profit. A rough classification of subjects shows that fourteen were on optics, twelve on electricity and magnetism, eight on general subjects, six on heat, three on sound and two on meteorology.

Ernest F. Nichols, vice-president of Section B, and Arthur G. Webster, vice-president of the American Physical Society, were the presiding officers.

In accordance with the revised constitution, several officers were elected to serve at the Washington meeting and also at future meetings, the object being to secure a more consistent and efficient policy of administration. Those officers which serve for several meetings, including the Washington meeting, are Dayton C. Miller, secretary for five years; and the following members of the sectional committee, Gordon F. Hull, five years; Arthur G. Webster, four years; D. B. Brace, three years; Ernest Merritt, two years; Ernest F. Nichols, *ex officio*, two years. The other officers for the Washington meeting, in addition to those mentioned above, were Henry S. Carhart, member of the council; W. S. Franklin, *ex officio* member of the sectional committee; Charles E. Mendenhall, member of the sectional committee; George F. Stradling, member of the general committee, and Lyman J. Briggs, press secretary.

The vice-president for the next, the St. Louis, meeting is Edwin H. Hall, of Harvard University.

On Monday the retiring vice-president, W. S. Franklin, gave an address on 'Popular Science,' which was listened to with great interest, and which drew out some spirited and valuable discussion. The paper has been given in full in a previous issue of SCIENCE. The abstracts of the other papers presented before Section B are given below:

The Semidiurnal Periods in the Earth's Atmosphere: FRANK H. BIGELOW, U. S. Weather Bureau.

There occur at the surface of the earth two types of diurnal periods in the meteorological elements. The temperature,

the wind direction and velocity, and the solar radiation have each one maximum and one minimum; the barometric pressure, the vapor tension, the electric potential have two maxima and two minima. There has been great difficulty in accounting for the simultaneous occurrence of these two types. Lord Kelvin advocates the theory of a forced semidiurnal dynamic wave in the atmosphere, and Dr. J. Hann, after vainly trying to reconcile the temperature and the pressure curves, appears obliged to accept Kelvin's view. Recent observations in the lower strata of the atmosphere with kites and balloons show that the surface double-wave becomes a single-wave at altitudes which are very moderate, about that of the cumulus clouds. It becomes, then, necessary to account for the transformation of the double- into the single-wave within these strata. It is done in this paper by discussing the action of the solar radiation in the atmosphere, and upon the earth's surface; and especially by indicating the effect of the outgoing terrestrial radiation upon the aqueous vapor sheet. This rises and falls daily, and it is shown by the method of volume contents of dry air and aqueous vapor that the known facts harmonize closely with the new theory as set forth by the author. Incidentally, a discussion of the normal solar spectrum energy curves at different temperatures, and the observed depleted energy curve as given by Professor Langley, indicates that the solar constant is probably about 4.0 gram calories and that the temperature of the solar photosphere is not far from 7500° C.

The Construction of a Sensitive Galvanometer. C. G. ABBOTT, Smithsonian Institution. With an introduction by S. P. LANGLEY, Smithsonian Institution.

For the last seven years the galvanometer of the bolometric apparatus of the

Smithsonian Astrophysical Observatory has been frequently modified in the interest of greater working sensitiveness. Starting in 1896 with a four-coil instrument of about 25 ohms resistance and with a computed constant of 2×10^{-10} ampères for a ten-seconds single swing, with scale distance one meter, it has now become a sixteen-coil instrument of only 1.6 ohms resistance and with an actual working constant at ten-seconds single swing of 5×10^{-11} ampères for scale distance of one meter. In practice, however, the scale distance is four meters, and one tenth division is readable, so that a current of about 1×10^{-12} ampères can be measured. The paper of Mr. Abbott describes the successive steps by means of which this change has occurred. These include modifications of the construction of support, case, surroundings, coils, needle system and mode of reading.

The Condition Governing the Coherence of Metals when there is an Electrical Discharge between them: CARL KINSLEY, University of Chicago.

In the many studies of coherence that have been made there has usually been a complete disregard of several of the conditions controlling coherence. It is necessary to know not only the potential at which the discharge takes place, but also the quantity of the discharge. The dielectric between the metals and its condition as to temperature and pressure is also of great importance. The condition of the surfaces, their size, shape and distance apart, must be known.

An apparatus enabling distance of the order of one four-hundredth of a wavelength of light to be measured was used. This made it possible to carry on the experimental work within distances such as those found in the usual form of coherer.

A Determination of the Frequency of Alternating Currents by the Automatic Adjustment of the Circuit to Resonance:
CARL KINSLEY, University of Chicago.

An electric current can be tuned to any frequency within a wide range by varying the self induction of the circuit. This may be automatically accomplished by using a moving core in the coil giving self induction. If the spring-held core is slightly beyond the position of resonance in the direction of too large self induction, it will be retained in equilibrium between the force of the spring and the pull of the coil. The plunger will, therefore, rise and fall in the coil as the varying frequency requires a greater or less self induction for resonance.

Charts were used showing the mode of operation of the method proposed.

On Methods of Measuring Radiant Efficiency: E. L. NICHOLS and W. W. COBLENTZ, Cornell University.

This paper deals with the visible and infra-red spectrum of the light transmitted by a water cell and by a water cell and iodine cell in combination, for the purpose of determining the nature of the correction which it is necessary to apply in finding the true radiant efficiency of sources of light. It is shown that in the case of a water cell one centimeter in thickness, at least five sixths of the transmitted energy belongs in the infra-red transparency of an iodine solution which is opaque to the visible rays is not such as to warrant the use of this cell for the purpose of determining the correction for the water cell. Comparison was made between the value for the radiant efficiency by the usual method of the water cell, the same value corrected by integration of the curves for the transmitted energy of the cell and the value of the radiant efficiency obtained by direct inte-

gration of the energy curve of the spectrum of the source. The recent contention of Angström that all determinations of radiant efficiency by means of the water cell thus far published give much too large a value, is shown to be fully justified.

The Infra-red Emission Spectrum of the Mercury Arc: W. C. GEER and W. W. COBLENTZ, Cornell University. Presented by E. L. Nichols.

While investigating the infra-red spectrum of the Aron's lamp, a grouping of the emission lines was observed which is of interest in connection with spectral series.

The vertex of the arc was used for a source of radiation. For this purpose a side tube, having a window of fluorite or rock salt, was placed at right angles to the plane of the arc. The spectrum was produced by means of a mirror spectrometer and rock-salt prism, while a Nicholas radiometer was used to measure the distribution of energy.

The spectrum was explored at every minute, and at certain places every 20" of arc of the spectrum circle up to 9 μ . It was found that the energy radiated consists of a series of emission bands at 1 μ and 5 μ , with a slight indication of a band at 3 μ . Nowhere in the spectrum was the intensity of the radiation from the arc very great, while beyond 6 μ the deflections due to the hot glass walls of the lamp were as great as those due to the arc. The lamp was kept in a water-bath.

The width of the spectrum covered by the radiometer vane at 1 μ was about .13 μ . The error at 1 μ is less than .01 μ , while at 4 μ the error is perhaps .03 μ .

Since in the region at 3 μ the radiometer showed slight deflections at times which were recorded as questionable, and since in all other parts of the spectrum from 2 to 4 μ no such effect could be detected, one is

led to believe that the indications at 3μ were real. The great variation in the intensity of these lines may be due, in part, to the fact that the slit subtends different angles in the two regions, and that the suspected line at 3μ is isolated, while the others occur in a group in which the intensity of each one is influenced by those adjoining it.

The presence of the bands of larger wave-lengths than 4μ indicates that the true radiant efficiency of the arc is lower than the values found in a previous investigation.

Experiments concerning Very Brief Electrical Contacts: HERSCHEL C. PARKER, Columbia University.

A series of electrical contacts giving a fairly accurate range of adjustment from 0.1 second to 0.00001 second would furnish a valuable means of investigation. A gravity contact key devised by Dr. Charles Forbes gives promise of fulfilling the above conditions. The writer has made many determinations of the times of contact given by the various devices employed on this key, and has also investigated the times of contact of several forms of pendulum.

The method employed was as follows: a condenser of known capacity (F , farads) was charged during the time of contact (T) and the deflection on discharging noted. This deflection (if a good mica condenser is used which has no absorption) is proportional to the electromotive force (E) and the capacity (F). The condenser is again charged through a resistance (R) and the deflection (Q) observed. Then:

$$Q = EF \times (1 - e^{-T/RF})$$

and,

$$T = -RF \times \log_e (1 - Q/EF).$$

The 'gravity key' consists essentially of a rectangular weight falling on metal

guides, the key being furnished with a scale divided in fractions of a second, according to the law of falling bodies, and the weight actuating the various forms of switches employed. If two switches are used, one to make the contact and the other to break the contact, by placing them at different distances apart on the scale, times of contact varying from 0.4 second to 0.001 second may be obtained. For shorter times a single switch that makes and breaks the contact is made use of, and the time made faster or slower by placing in different positions on the scale so that the falling weight strikes it with varying velocities.

In one form, the weight moves the short arm of a lever, the long arm passing over a contact strip. Another form is one in which the fulcrum of the lever changes, first giving contact and then breaking the circuit immediately afterwards. In still another type the falling weight strikes a lever arm and releases a spring, which makes the contact, and a further motion of the lever breaks the contact, thus giving a differential effect between the velocity of the weight and the rapidity of the spring. With this key it is possible to obtain a contact of only 0.000017 second and with careful adjustment it seems possible to reach 0.00001 second.

Experiments made with pendulums consisting of a steel ball suspended by a wire, and striking against a steel anvil, gave very positive and satisfactory contacts. Using a pendulum with the suspension wire about four meters long and the steel ball two inches in diameter, an arc of $\frac{1}{2}^\circ$ gave 0.00039 second, while a pendulum with a short suspension wire using one-half-inch steel ball, through an arc of 90° gave 0.000079 second.

It is interesting to note that in working with condensers the best mica condenser gives no appreciable variation in capacity

for the very briefest times of charge, while a paraffine condenser may show a reduction in capacity of some sixty per cent. from a time of charge of 0.4 second to that of 0.001 second.

Derivation of Equation of Decaying Sound in a Room, and Definition of Open Window Equivalent of Absorbing Power of the Room: W. S. FRANKLIN, Lehigh University.

1. The paper presents a derivation of the equation

$$i = Ie^{-\frac{86a}{v}t},$$

in which I is the initial intensity of sound in a room, i is the intensity t seconds after the source has ceased, v is the volume of the room, a is the open window area which is equivalent to the absorbing power of the wall and objects in the room, and e is the Napierian base.

2. The paper then gives a definition of the open window equivalent of the absorbing power of the walls and objects in a room.

3. The paper then compares the theoretically derived equation for duration of reverberation, namely,

$$t_1 = 0.165 \frac{v}{a},$$

with the equation used by Sabine in which the numerical factor is based upon experiment.

4. The paper then discusses briefly the physical actions involved in the absorption of sound by the walls and objects in a room.

On the Velocity of Light as affected by Motion through the Ether: EDWARD W. MORLEY, Western Reserve University, and DAYTON C. MILLER, Case School of Applied Science.

The theory of the Michelson-Morley experiment contained in their paper of 1887

was elaborated as far as seemed needful in view of the negative result of their experiment. This paper gives some account of a more detailed theory and announces some preliminary results of the more recent experiments.

Some Measures of the Speed of Photographic Shutters: EDWARD W. MORLEY, Western Reserve University, and DAYTON C. MILLER, Case School of Applied Science.

A stroboscopic electrically driven tuning-fork and a special camera containing a cylindrical sensitive film were arranged to obtain graphic representations of the behavior of shutters. The exact manner and time of opening and closing, as well as the aperture and duration of exposure, are recorded.

Of the better grade of shutters designed to give definite and adjustable exposures, it was found that they were fairly constant in operation, but that the actual duration of exposure is often not even approximately that indicated by the maker. Different shutters of the same make and form give widely different exposures when set for the same time. It was found in all the shutters tested that the times marked one seventy-fifth of a second or less were all of the same duration, and that this was much less than the shortest marked time, namely, from three to four thousandths of a second. If the time scale for each separate shutter of this grade were constructed upon tests of the shutter, it might then be used to give practically correct exposures.

With the best shutters of the diaphragm class the duration of exposure is nearly independent of the aperture of the opening.

Some shutters of the cheaper grades designed to give long, medium and short exposures were found to give equal ex-

posures in the three cases. In general, shutters of this grade with timing devices are wholly unreliable.

On the Distribution of Pressure around Spheres in a Viscous Fluid: S. R. COOK, Case School of Applied Science.

When a single sphere is set in motion in a perfect fluid at rest at infinity, its motion is completely determined by the velocity potential due to the motion of the sphere; and the pressure around the sphere is given by

$$\frac{p}{\rho} = \frac{d\varphi}{dt} - \frac{1}{2}u^2 + F(t) \quad (1)$$

Where φ is the velocity potential and u is the velocity of the sphere at time t .

When u is constant (1) may be written in the form

$$\frac{p}{\rho} = u^2 \left\{ \frac{2}{3} \cos^2 \theta - \frac{5}{6} \right\}, \quad (2)$$

where θ is measured from the direction of motion.

The curve for the pressure of a perfect fluid around a sphere was given, and also the curve for the pressure of air, which was determined by measuring the pressure of the air around a glass sphere by means of a water manometer while the air is flowing with a constant velocity past the sphere. The two curves differ, in that, for a perfect fluid the curve is symmetrical with respect to both axes, as may be seen from (2), while for a viscous fluid, i. e., air, the curve is symmetrical with respect to the axis parallel to the direction of flow, but not with respect to the axis at right angles, the pressure at the rear being less than that in front of the sphere.

The pressure was also determined for two spheres moving in line of centers and for two spheres moving perpendicular to the line of centers. The equations which represent the pressure for a perfect fluid were given and the curves of pressure

around the spheres compared with the curves obtained by measurements of the pressure in air. It was found that two spheres moving in the line of their centers in a perfect fluid are repelled, but when moving in a viscous fluid are attracted. For spheres moving perpendicular to their line of centers in a perfect fluid they were attracted, and in a viscous fluid repelled.

These results agree with results given in a former paper on 'Flutings in a Sound Wave' and corroborate the theory there advanced as an explanation of the cause of the flutings in a Kundt-tube.

A Portable Apparatus for the Measurement of Sound: A. G. WEBSTER, Clark University.

An improved form of the instrument shown at the Boston meeting, 1898.

The apparatus consists of two parts, a 'phone,' or apparatus for emitting continuously a pure tone, whose intensity is measured in absolute units (watts), and of a 'phonometer,' or instrument which measures at any point the intensity of the sound emitted by the phone or other source of sound measuring the absolute compression of the air. The amplitude of a diaphragm forming the back of a resonator is measured by the displacement of fringes in an interferometer, observed stroboscopically. Both parts of the apparatus are portable, and suitable for field work.

The Mechanical Efficiency of Musical Instruments as Sound Producers: A. G. WEBSTER, Clark University.

The sound emitted was measured by the phonometer, by comparison with the phone placed in the same place where the instrument was. The input of energy was obtained by measurement of the pressure, and time rate of air consumption for wind instruments, and by the pull of the bow and velocity for stringed instruments. Preliminary results were given for the

cornet, French horn, bombardino, saxophone, clarinet, oboe, voice and violin. The mechanical efficiency is generally between one thousandth and one hundredth. An idea of the magnitudes involved can be got from the statement that the sound emitted from five to ten million cornets would equal a horse-power.

The Damped Ballistic Galvanometer: O. M. STEWART, University of Missouri.

It is usually assumed that a ballistic galvanometer if well damped does not give deflections strictly proportional to the quantity of electricity discharged through it. It has, however, been found experimentally that such an error if any is very small. The theory of the ballistic galvanometer is developed for the two general cases: (1) periodic vibrations, and (2) aperiodic vibrations. In both cases the deflection is strictly proportional to the quantity discharged through it. Effect of the damping on the sensibility of the galvanometer is discussed.

On the Electrical Conductivity of Solutions in Amyl Amine: LOUIS KAHLENBERG, University of Wisconsin.

The dielectric constant of amyl amine is 4.50, while that of chloroform is 3.95 and that of ether is 4.37. Chloroform solutions that conduct electricity appreciably are unknown; ethereal solutions are also extremely poor electrolytes. Ferric chloride dissolved in chloroform or ether yields solutions that are practically insulators. It was, therefore, of interest to determine the conductivity of solutions in amyl amine. The amyl amine was dried with fused caustic potash and redistilled. Its specific conductivity was less than 8.2×10^{-8} . Cadmium iodide, silver nitrate and ferric chloride are soluble in amyl amine, and the solutions are electrolytes. Their conductivity was measured by means of the Kohlrausch

method. In the case of cadmium solution the molecular conductivity first increases with the dilution and then it increases on further dilution, the maximum (0.542) occurring when one gram molecule is contained in about one and one tenth liters. The mol. cond. is almost *nil* when one gram mol. is present in six liters. Silver nitrate solutions act similarly, the maximum (1.48) occurring when one gram mol. is present in about one and two tenths liters. The cond. is exceedingly low when one gram mol. is contained in 31 liters. In the case of ferric chloride the mol. cond. decreased continuously (from 0.217 at $v = 5.021$) as the solution became more dilute, rapidly dwindling to a very small value at about the same concentration as the AgNO_3 solutions. The conductivities of solutions of these three salts at higher dilutions than those mentioned were found to be practically negligible. The results show that, contrary to what one would expect according to the Nernst-Thomson rule, amyl amine yields solutions that conduct well enough readily to admit of measurement. Again the change of the mol. cond. as the solutions are diluted is such that it can not be harmonized with the theory of electrolytic dissociation. The fact that the mol. cond. dwindles to practically nothing in solutions of the concentration above mentioned is particularly interesting. Potassium iodide and sodium oleate are insoluble in amyl amine. Copper oleate is soluble, but the solutions conduct no better than the pure solvent.

On the Thermal Conductivity of Glass: H. W. SPRINGSTEEN, Case School of Applied Science.

Some Relations between Science and the Patent System: CHARLES K. WEAD, U. S. Patent Office.

This informal paper will call to the at-

tention of the section as it meets in Washington certain unique opportunities for research afforded to the public by the Patent Office and printed patents.

The relations may be grouped under three heads:

1. The patent system, its laws, methods and collections, as an organized body of material.

2. Scientific men as inventors and patentees.

3. The usefulness of printed patents to scientific men.

Why the E.M.F. of the Daniell Cell changes when the Densities of the Solutions Change: HENRY S. CARHART, University of Michigan.

In my paper read at the Pittsburgh meeting of the American Association for the Advancement of Science I applied the increase of thermo-electromotive force per degree between a metal and a solution of one of its salts with the density of the solution to the above problem. An increase in the density of the zinc sulphate solution increases the back thermo-electromotive force, and so decreases the E.M.F. of the cell as a whole.

The writer's explanation has been criticised on the ground that the heat of formation of both zinc sulphate and copper sulphate, in aqueous solution, decreases as the density increases. The result would appear to be a rational explanation of the change of E.M.F. of the Daniell cell without any regard to the thermo-electromotive force and its variation with the density of the solution.

To test this question I have measured the E.M.F. of a Daniell cell of a special form set up with concentrated copper sulphate solution, and, first, with 1/16N zinc sulphate solution; and, second, with a normal zinc sulphate solution. The E.M.F. in the second case is less than in the former by

0.021 volt at 20° C. The difference calculated from the thermo-electromotive forces is 0.029 volt, without taking into account the E.M.F. at the junction of the two solutions. The thermal E.M.F. is then abundantly large enough to explain the phenomenon.

Further, the most interesting fact about this is that the observed change of E.M.F. of the Daniell cell is exactly the E.M.F. of a concentration cell set up with the two zinc sulphate solutions. A little consideration shows that such should be the case, but I am not aware that this point has been observed before.

Preliminary Report on an Absolute Measurement of the E.M.F. of the Cadmium Cell: HENRY S. CARHART and KARL E. GUTHE, University of Michigan.

The paper will describe the preparation of the materials for the cadmium cells used, will give a comparison of their E.M.F.'s, will describe the new electro-dynamometer built for the measurement of the current which produces a fall of potential over a known resistance, this fall of potential being compared with the E.M.F. of the cadmium cell. If secured in time, some results of the measurement will also be given.

The Characteristic Absorption Curves of the Permanganates: B. E. MOORE, University of Nebraska.

A spectrophotometric study of solutions of potassium and zinc permanganate was made. These solutions were prepared nearly saturated (concentration not yet determined). Then solutions diluted 10, 100 and 1,000 times were studied.

For all points in the spectrum the value K (the thickness of the standard concentration which would absorb ninety per cent. of light) is calculated. This value changes from point to point in the spectrum, but should not change at any fixed point in

the spectrum upon dilution, unless some change in the solution occurs. The strongly absorbing region of these solutions shows five bands. Ostwald shows that twelve permanganates in dilute solution show identical positions for four of these bands, which suggests at once identical color for common ions. Indeed, Ostwald gives a large series of solutions of different common ions to support this conclusion. Still, it must be readily recognized that the color of a solution is determined by the magnitude of absorption, both inside and outside the absorption band, as well as by the position of the bands. This determination requires a spectrophotometric study, although it is a tediously slow process in comparison to the other method. Spectrophotometrically studied those two permanganates show that the bands are identical for both substances in all concentrations. For the potassium permanganate the relative transparency in the band region increases slightly upon dilution. The zinc permanganate remains constant for all concentrations in this region. Outside the characteristic absorption bands, in both blue and red, both solutions show marked increase in relative absorption upon dilution. That is, increased ionization has caused a change *outside* the bands, not *in* the band region itself.

Note: Even in concentrated solutions, permanganates would have a large dissociation coefficient, hence a small difference in ionization could only be realized upon great dilution. Owing to the slight solubility of several permanganates, one is still farther restricted in the choice of substances. Hence so far I have only been able to examine the two substances.

The Magnetic Rotary Dispersion of Solutions of Anomalous Dispersive Substances: F. J. BATES, University of Nebraska. Presented by D. B. BRACE.

The rotation of the plane of polarization of a ray of light, when passed through a substance in a direction parallel to the lines of force, has been found on theoretical grounds to be proportional to $du/d\lambda$, where u is the index of refraction of the substance for the wave-length λ . Consequently in solutions showing anomalous dispersion there should be an anomaly in this rotation wherever there is an anomaly in the refractive index. The author has studied very dilute solutions of fuchsin, cyanin, analine (blue) and litmus with an improved form of polariscope. The mean error of a setting for any wave-length was less than $.01^\circ$; while the best results claimed by previous investigators, who obtained anomalous effects, is a probable error of $.03^\circ$.

The first observations indicated that the apparent anomalies were present in these solutions; but further investigation proved them to be spurious. After eliminating these effects no anomalies were obtained. Hence, although anomalous dispersive substances may possess an anomalous Faraday effect, its magnitude is much less than it has heretofore been considered.

The Investigation of the Atmospheric Circulation in the Tropics: A. LAWRENCE ROTCH, Blue Hill Meteorological Observatory.

It is generally believed that the currents which ascend from the thermal equator proceed immediately as southwest and northwest anti-trades over the northeast and southeast trades-winds, and that the greater part of the anti-trade descends to the surface of the ocean north and south of the trades and continues to the poles as the prevailing southwest or northwest winds of the north or south temperate zones. This hypothesis is not sustained by the observations of the movements of volcanic dust and of upper clouds, which indi-

cate a strong easterly wind above the equator, shifting suddenly, at about 20° north and south latitudes, to southwest and west. We do not know the depth of the trades, and nothing about the vertical variations of temperature and humidity over the ocean, nor whether sudden changes in these elements occur between the trade and the anti-trade.

The author proposes to investigate these and other questions by means of kites carrying self-recording instruments which, flown from his observatory on Blue Hill, near Boston, during the past nine years, have much increased our knowledge of the atmosphere in this region up to a height of three miles. Experiments made by him in 1901, in flying kites from a steamer crossing the north Atlantic, proved that in this way observations could be obtained in the upper air independently of the wind.

He now desires to make these atmospheric soundings between the Azores and Ascension Island, and is endeavoring to obtain the funds necessary to charter and equip a steamer, believing that in this way some of the most important problems in meteorology and physical geography may be solved.

Anomalous Dispersion and Selective Absorption of Fuchsin: WM. B. CARLMEL, National Bureau of Standards. Presented by D. B. Brace.

To give a brief and concise account of this work, I may state that it consists of a determination of the dispersion curve by interferential means, and of the absorption by means of a Brace spectrophotometer. The methods of procedure have necessarily been somewhat novel because fuchsin is so strongly absorbing that it is not possible to determine the dispersion curve in the usual manner.

The chief difficulty in the determination of the dispersion curve by interferen-

tial means is that the light of one path of the interferometer, after passing through the film, is so reduced in intensity that it is too weak to produce interference when it meets the undiminished light from the other path. By partly balancing up the intensity of the two paths by means of an absorbing screen, and by using a form of interferometer which only allowed the light to traverse the film once, and which rejected the enormous amount of light reflected from the surface of the film, it was found possible to obtain good fringes throughout the visible spectrum. The retardations were determined by means of spectral bands, using a mica compensator.

The absorption of the same specimen of fuchsin was determined by means of a form of spectrophotometer which allowed an unusually great intensity of light to be used. The absorption has only been determined in part before, because of the difficulties encountered. A complete determination has been made throughout the spectrum, which agrees quite well with the values found by other experimenters in the portion of the spectrum in which they had made measurements.

The work was done upon films of from 0.2 micron thick to 0.6 micron thick. The thicknesses were determined from the interference bands of thin films, and are correct to within about four or five per cent.

The Coefficient of Expansion of Some Alloys of Nickel and Cast Iron: THEO. M. FOCKE, Case School of Applied Science.

In Appendix No. 6 of the report of the Coast and Geodetic Survey for 1900, Mr. E. G. Fischer describes a new precise level, in which an alloy of nickel and cast iron replaces the brass ordinarily used.

The experiments described in this paper were undertaken to find the composition

of the alloy which should have the least coefficient of expansion. The results are given in the following table:

Percentage.		Coefficient.	Mean Temp.
Nickel.	Cast Iron.		
33½	66½	.00000543	31.5
35	65	.00000410	31.5
36	64	.00000397	31.0
36½	63½	.00000403	32.0

Sulphur Dioxide and the Binary-Vapor Engine: R. H. THURSTON, Cornell University.

A New Apparatus for Demonstrating Wave Motion: FRED. J. HILLIG, St. John's College.

The instrument is used to demonstrate the theory of radiation, particularly the different wave-forms (longitudinal and transversal), polarization and diffraction. The apparatus consists of a network of rubber strings, at the intersection of which lead balls are suspended.

Demonstration of a Portable High Tension Coil and Ozone Generator: G. LENOX CURTIS, New York city.

For several years I have been experimenting with a high tension coil which is attached to the street main of 110 or more volts. The current is multiplied to one million volts, while the ampèreage is reduced to a fraction of one ampère. The object of the apparatus is to produce ozone for therapeutical purposes. It apparently has but a single pole, the atmosphere being the negative pole.

To the coil are attached ozone generators, inhalers, Geisler and X-ray tubes. The apparatus is portable and can be used wherever there is an incandescent current, or the current may be supplied from a battery; it is, therefore, adapted to sick-room practice. The current and ozone, by this device, may be carried into and through the body, oxidizing pathogenic

conditions, reestablishing nutrition, and restoring the blood to normal. There is no shock nor unpleasant feeling to the patient. This method as demonstrated by five years' active practice, in which many diseases have been treated, is probably the most effective of any now in vogue. It appears to be equally advantageous in the treatment of acute and chronic cases. It quickly reduces fevers, controls pneumonia and diseases of suppurative character, and increases vitality. By passing the electrode over the body, superficial and deep-seated congestions may be located, and within an unusually short period normal circulation is reestablished. This fact has been demonstrated in the treatment of meningitis, pneumonia, tuberculosis, neuritis, etc., and the long chain of affections arising from autointoxication is virtually controlled. Sufficient ozone can be generated by this device to quickly disinfect the sickroom or hospital ward.

DAYTON C. MILLER,
Secretary of Section B.

MEETING OF THE AMERICAN PHYSICAL SOCIETY.

ON Wednesday, December 31, a joint meeting of Section B and the American Physical Society was held, at which Professor A. G. Webster, vice-president of the society, presided. The annual election resulted in the choice of the following officers for the current year:

President—Arthur G. Webster.

Vice-President—Elihu Thomson.

Secretary—Ernest Merritt.

Treasurer—William Hallock.

Members of the Council—W. F. Magie and E. H. Hall.

The first paper on the program was by Dr. L. A. Bauer, 'On the Results of Comparisons of Magnetic Instruments.' These comparisons had been made by the magnetic survey and showed a very satisfactory agreement among the different instru-

ments used, which represented types from all parts of the world. Mr. Bauer referred especially to the satisfactory performance of certain earth inductors, which were able to give dip determinations with such accuracy as to readily show the diurnal variations. Mr. Bauer also gave a report of the observations made at the time of the solar eclipse in 1901 to detect the presence of magnetic disturbances accompanying it. Observations had been made at thirty different points distributed all over the world. Unmistakable evidences of magnetic disturbances were shown by the curves exhibited, the maximum of the disturbance occurring at the time of totality. Since the time of totality was widely different at different points, the effect observed could not be due to disturbances of the ordinary kind.

Professor E. F. Nichols and G. F. Hull presented a very interesting paper giving the final results of their work on the 'Pressure Due to Radiation.' Since their first work on this subject alterations in the apparatus had been made which permitted of much greater accuracy in the results. The pressure as computed from the observed energy of the radiation used was found to agree with the pressure actually observed to within 1 per cent., the greatest variation being 1.1 per cent. and the more usual variation being about 0.6 per cent. The effect of wave-length on the pressure was tested by using light which had been filtered through a water cell or through red glass. In each case the pressure was found to depend upon the energy only, and no indication of any dependence upon wave-length was observed. This is in accordance with theory.

In connection with this work the authors also described an experiment by which something greatly resembling a comet's tail was obtained under conditions approximating those of nature. A powder con-

sisting of a mixture of emery and puff-ball spores was placed in a vacuum tube constructed somewhat like an hour-glass. The vacuum was made as perfect as could be obtained, precautions being also used to get rid of mercury vapor. Upon pouring the powder from one part of the tube to the other, and at the same time concentrating upon it the rays from an arc, the lighter portions of the powder were seen to be blown out as though repelled by the light, and presented an appearance quite similar to that of a comet's tail. The effect was of the same order of magnitude as would be expected from the authors' values for light pressure. The authors considered it quite possible that the phenomena might in part be due to other causes; but even if this is true the experiment reproduces the behavior of a comet's tail with great accuracy. The apparatus used in measuring light pressure and with the tube showing the laboratory comet's tail were exhibited.

Professor E. H. Hall gave a historical account of the various experiments that have been made to detect a southerly deviation of a falling body, and described recent experiments by himself on the same subject. With suitable precautions to avoid disturbances, nearly 1,000 balls had been dropped through a distance of about 23 meters. The average deviation toward the south was 0.05 mm. The results are especially interesting, since the theory of the subject as developed by Gauss and others does not indicate that any deviation should be expected, while most previous experiments, like those of Professor Hall, indicate a slight effect.

The papers by J. R. Benton, viz., 'The Elasticity of Copper and Iron at -186° C.,' 'Thermodynamic Formulæ for Isotropic Solids Subject to Tension' and 'Experiments in Connection with Friction Between Solids and Liquids,' will have been

published in full* before the appearance of this account.

The first results of a determination of the Heat of Vaporization of Oxygen were reported by Dr. J. S. Shearer. The method used was an electrical one similar to that already used by the author with liquid air. The value obtained was 58.9. Experiments to determine the heat of vaporization of nitrogen were in progress, but not yet completed.

Professor R. W. Wood described and exhibited a screen which was transparent to ultra-violet light, while being opaque to the rest of the spectrum. Such a screen is very useful in photographing ultra-violet spectra, since it enables the overlapping spectra of other orders to be eliminated. The author showed an interesting lecture experiment in which the rays of the lantern, after passing through such a screen, were concentrated to an invisible focus where a suitable fluorescent substance was excited. The screen was made by combining a gelatine film containing nitroso-dimethyl-aniline with copper oxide and cobalt glass.

A group of papers dealing with radioactivity occupied the first half of the Wednesday afternoon session and aroused much interest. It is a subject for congratulation that work along these lines is increasing on this side of the Atlantic, and that so many important papers dealing with the subject should be presented to the Physical Society. In a paper on the 'Magnetic and Electrical Deviation of the Easily Absorbed Rays from Radium' Professor Rutherford described experiments showing that these non-penetrating '*a*-rays' are slightly deviated in passing through a magnetic field. The deviation is opposite in sense to that of the cathode rays. The deviation of the *a*-rays in an electric field

is also opposite to that of cathode rays. It would, therefore, appear that these rays are in all likelihood *positively* charged particles. Both the magnetic and the electric deviations were very small. In order to get results it was necessary to use intensely active radium and strong fields. The author's measurements indicate for the velocity a value of about 2.5×10^4 cm./sec., and for the ratio of charge to mass the value 6×10^3 . It would thus appear that the *a*-rays are similar in character to the 'canal rays' of the vacuum tube, the size of the particles constituting the rays being comparable to the size of atoms. The author pointed out that this result is in harmony with the fact previously observed that the coefficient of absorption of a substance for such rays depends upon the thickness of the absorbing layer already traversed and increases rapidly with this thickness.

An article by Professor Rutherford and Mr. H. L. Cook, on a 'Penetrating Radiation from the Earth's Surface,' gave the results of experiments which indicate that part at least of the so-called spontaneous ionization of air in a closed place is due to radiation from outside. It was found that in a closed vessel surrounded by a screen of lead one inch thick the ionization was reduced to 68 per cent. of the value obtained without the lead. The results indicated that the rays, which were in part absorbed by the lead, proceeded from all directions and originated at or near the surface of all bodies in the neighborhood. The authors were of the opinion that the ionization upon the interior of a closed vessel was due in part also to a radiation proceeding from the surface of the surrounding vessel. This was made probable by the fact that a screen of iron seemed to be more effective in reducing the ionization than one of lead, while if the vessel containing the air was

* *Physical Review*, January, 1903.

sunk in a tank of water the action could be reduced still further. The assumption that iron and water radiate less strongly than lead would explain these results. In the case of lead the presumably more complete absorption of the rays from outside is more than balanced by the increased radiation from the metal itself.

Professor McLennan, of Toronto University, reported the results of experiments made at the foot of Niagara Falls to determine the induced radioactivity at that point. An insulated wire mounted immediately at the foot of the falls on the American side and maintained at a negative potential was found to acquire a much less induced activity than would be acquired by the same wire under similar circumstances at Toronto. It was found unnecessary actually to charge the wire when at the foot of the falls, since it received a negative charge from the air or spray, the potential being about that needed for the experiment. The activity acquired at the foot of the falls was found to be only about one sixth of that obtained at Toronto. The author also described experiments made in the neighborhood of a static machine in operation. It was found that the activity acquired by a metal disk when placed near the machine and negatively charged was much less than when the same disk was placed at a greater distance. It was also found that the activity acquired by a body placed in a closed room diminished with time.

A paper by Professor McLennan and Mr. E. F. Burton on the 'Electrical Conductivity of Air' dealt with experiments somewhat similar in character to those described in the paper by Rutherford and Cook mentioned above. It was found that air placed in a closed vessel showed at first a rapid diminution in conductivity, but that later its conductivity increased again.

The effect was more marked at greater pressures. The general form of the curve showing the variation of conductivity was the same for vessels made of different materials, but the initial diminution and subsequent increase of conductivity were much more marked in some than in others. The authors think that the result is due to an emanation or radiation issuing from the walls of the containing vessel. The rapid decrease in conductivity at first is due to the dying out of the conductivity originally possessed by the air, while the subsequent increase is the result of the emanation or radiation from the walls. It will be noticed that this conclusion is practically the same as that reached by Rutherford and Cook. The fact that the results of these entirely independent experiments should be announced at the same meeting of the Physical Society presents an unusual and interesting coincidence.

A paper on the 'Radioactivity of Freshly Fallen Snow,' by Mr. S. J. Allen, showed that snow, like rain, possesses marked radioactivity, which, however, is rapidly lost. The activity of snow was found to fall to one half its initial value in thirty minutes. If the snow is melted and the resulting water evaporated something possessing radioactivity is left behind. The radiation from snow consists chiefly of the easily absorbed rays. In the discussion of this paper Professor McLennan stated that he had found that after a fall of snow a negatively charged wire acquired less activity than before the snow-storm. It would seem as though the active constituent of the atmosphere had been removed by the snow.

In a paper 'On the Double Refraction of Dielectrics in a Magnetic Field in a Direction at Right Angles to the Lines of Force,' by D. B. Brace, the author called attention to the fact that the existence of double circular refraction along the magnetic

lines of force has been definitely established from theoretical considerations. Voigt has obtained equations which indicate not only this result, but also double refraction at right angles to the lines of force. The experimental results of Voigt apparently confirm this conclusion for glass and sodium vapor. The author calls attention to the fact that the results obtained by Voigt might be due to the Faraday effect. He finds this to be the case with glass, but confirms Voigt's conclusion for sodium vapor.

The next paper was by Professor A. Wilmer Duff, on the 'Viscosity of Liquids at Low Rates of Shear.' According to ideas developed by Poisson, Maxwell, and others, a liquid differs from a solid in having either a low modulus of rigidity or a high rate of relaxation under shearing stress, and the coefficient of viscosity contains a term that varies inversely as the rate of shear. Experiments by Professor Duff, made at a rate of shear about 1,000 times lower than the lowest in Poisenille's experiments, seem to show that, while the coefficient of viscosity of kerosene is the same within rates of shear that vary as 50,000 to 1, that of water is slightly larger at the low rates of shear than at the high rates used in Poisenille's experiments. This might be interpreted as indicating a definite, although very narrow, limit of perfect elasticity for water under shearing stresses.

'Results of Determinations of the Mechanical Efficiency of Musical Instruments,' were presented by Professor A. G. Webster. The determinations were made with the help of the apparatus designed by the author for sound measurements, which was described at the April, 1902, meeting of the Society. The efficiencies obtained were extremely small, indicating that sound-producing machines are even more

inefficient than those used in producing light.

A paper by Dr. Herschel C. Parker on 'Experiments with Very Brief Electrical Contacts' gave an account of tests of a gravity contact key devised by Dr. Charles Forbes. The apparatus itself had been exhibited at a former meeting. Dr. Parker finds that reliable contacts can be obtained ranging in duration from 0.1 sec. to about 0.00001 sec.

Brief papers by Professor W. J. Humphreys, on 'A Comprehensive Boyle's Law Apparatus' and 'A Lecture-room Method of Analyzing Irregular Electric Currents,' dealt with these subjects from the pedagogical standpoint.

The last paper on the program was by Dr. C. A. Skinner, on the 'Critical Current Density and Cathode Drop in Vacuum Tubes.' The author referred to the difference in the formulæ obtained by Stark and himself giving a relation between cathode drop, current density, and pressure. Dr. Skinner explains the difference as due to the fact that wire electrodes were used in the experiments of Stark, while in the case of his own experiments disk electrodes had been used.

As one day proved too short a time to complete the program of the society, the joint meeting with Section B was continued on Thursday, January 1, a number of the above-mentioned papers being presented on that day. The meeting may properly be regarded as one of the most interesting and successful which the society has ever held.

ERNEST MERRITT,

Secretary.

SCIENTIFIC BOOKS.

A Nature Wooing at Ormond by the Sea. By W. S. BLATCHLEY, author of 'Gleanings from Nature.' Indianapolis, The Nature Publishing Company. 1902. 12mo. Pp. 245.

The author went to Florida in the early

part of 1899 in the quest of health and occupied himself by observing 'facts and fancies about animals and plants.' His place of residence was about a hundred miles south of Jacksonville. His observations, with occasional reveries on other subjects, combined with remarks upon the conditions prevailing in the times of Bartram, Michaux and Say, make up the chief part of the volume. In an appendix he presents a list, with notes, of one hundred and fifty species of insects collected.

The most important discovery made was that of the left humerus of the great auk from a large shell mound on the Spanish Grant. The writer found a second specimen of a similar animal thirty feet distant from the one obtained by Mr. Blatchley (see SCIENCE, XVI., p. 203). Hence it would seem as if the facts were well established that the great auk was once a resident of Florida, and presumably of the whole Atlantic coast.

This mound is over one thousand feet long and ten feet thick, composed largely of the shell of the *Donax*, which is still used for food. Twenty-seven other species of mollusca were secured, besides several fish, turtles, alligators and half a dozen mammals. A few implements were also picked up.

The author presents his facts in a very pleasant way, easily appreciated by all intelligent people, apart from tourists and scientists.

C. H. HITCHCOCK.

HANOVER, N. H.

SCIENTIFIC JOURNALS AND ARTICLES.

Journal of Physical Chemistry, December.—'On the Passage of a Direct Current Through an Electrolytic Cell,' by S. L. Bigelow. A study of the cause of the residual current when the electromotive force is below the decomposition point. 'On the Critical States of a Binary System,' by Paul Saurel. 'Deduction of the Magnitude of the Osmotic Pressure in Dilute Solutions according to the Kinetic Theory,' by Peter Fireman. The deduction is drawn that the osmotic pressure of a substance in dilute solution is equal to the corresponding gas pressure of that substance at the same temperature. The conclusion is also drawn that, in general, the kinetic

energy of the molecules of a liquid is equal to that of gas molecules at the same temperature. This number of the *Journal* also contains the index to Volume VI.

January.—'The Rate of Oxidation of Ferrous Salts by Chromic Acid,' by Clara C. Benson. This paper includes an analytical method for determining ferrous iron in the presence of ferric salts and chromic acid. 'Electromotive Force of Alloys of Tin, Lead and Bismuth,' by E. A. Shepherd. 'Reduction of Insoluble Cathodes,' by Alfred T. Weightman. Chiefly a study of the reduction of lead sulfid. 'Electrolytic Preparation of Sodium Amalgam,' by E. S. Shepherd.

THE *Journal of Comparative Neurology* for December contains the following articles: 'On the Origin of Neuroglia Tissue from the Mesoblast,' by Shinkishi Hatai. Describes and figures the proliferation of neuroglia cells from the walls of the embryonic capillaries. 'On the Number and on the Relation between Diameter and Distribution of the Nerve Fibers Innervating the Leg of the Frog,' by Elizabeth Hopkins Dunn. A continuation and control of a previous study, showing, among other conclusions, that the largest nerve fibers do not run the longest course, as Schwalbe supposed, but terminate in the thigh. In the next paper, 'A Note on the Significance of the Size of Nerve Fibers in Fishes,' by C. Judson Herrick, this conclusion is confirmed for the fishes, and observations presented tending to show that the size of nerve fibers, within certain limits, is determined by the state of functional development of the organ innervated. 'The Eye of the Common Mole, *Scalops aquaticus macrinus*,' by James Rollin Slonaker. The eye is described in detail and found to be in so greatly reduced condition as to render it very improbable that it can function at all. Twenty pages of book reviews complete the number.

SOCIETIES AND ACADEMIES.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

THE 174th regular meeting was held on January 8, 1903, eighteen members and two

visitors present. Officers for 1903 were elected as follows:

President—Mr. D. W. Coquillett.

Vice-Presidents—Mr. Nathan Banks and Dr. A. D. Hopkins.

Recording Secretary—Mr. Rolla P. Currie.

Corresponding Secretary—Mr. Frank Benton.

Treasurer—Mr. J. D. Patten.

Members of the Executive Committee (in addition to the officers)—Dr. H. G. Dyar, Dr. L. O. Howard and Mr. C. L. Marlatt.

Mr. W. E. Hinds, Field Agent in the Division of Entomology, U. S. Department of Agriculture, was elected a corresponding member.

Dr. Dyar read his address as retiring president, entitled 'Recent Work in Lepidoptera.' The author stated that the classification of Lepidoptera, ten years ago, stood essentially as in the time of Linnæus. During the past few years, however, material changes have had to be made as the relationships of families and genera have come to be better understood. The studies of Meyrick, Hampson, Chapman and Tutt in England, and those of Comstock, Packard, Kellogg, Bodine and the author in America, have led them to adopt a common general scheme of classification, though difference of opinion still exists as to the details of this scheme. The author reviewed briefly the work of recent American lepidopterists. Taking up the butterflies, he compared the work of Scudder and Edwards, mentioning also that of French, Holland, Skinner and Beutenmüller. He then spoke of what has been done in the different groups of moths—in the Sphingidæ by Beutenmüller and Packard, in the Saturnians by Neumoegen and Dyar and also by Packard, in the Noctuidæ by Grote and Smith, in the Notodontidæ by Packard, in the Geometridæ by Hulst, in the Pyralids by Fernald, and in the Tineids by Lord Walsingham and recently also by Dietz, Kearfott and Busck. The author summed up by pointing out the work particularly needed in the near future, viz., a monograph of the butterflies, comprehensive works on Sphingid and Noctuid larvæ, a monograph of the Geometridæ, supplementing and reviewing Dr. Hulst's work, tables for determining the Tortricidæ, and continued descriptions of new species of Tineids.

Mr. Banks presented his 'Notes on Brachynemuri of the *B. ferox* Group.' A critical study of large series of specimens heretofore determined as belonging to the species *peregrinus*, *carrizonus*, *ferox* and *quadripunctatus* resulted in the discovery of three more forms hitherto undescribed. *Brachynemurus peregrinus* Hagen is considered a synonym of *B. ferox* Walker. The author presented descriptions, exhibiting specimens and a plate of drawings showing the inter-antennal and prothoracic markings and profile views of the male anal appendages.

ROLLA P. CURRIE,
Recording Secretary.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

THE 135th meeting (tenth annual meeting) was held in Washington, December 17, 1902. Major C. E. Dutton spoke informally of the geologic work of the late Major J. W. Powell, and Mr. Bailey Willis of the work of the late Dr. R. B. Rowe.

After the conclusion of the regular program, the annual meeting was held, at which the reports of the secretaries and of the treasurer were presented. The election of officers resulted as follows:

President—C. Willard Hayes.

Vice-Presidents—G. P. Merrill and Waldemar Lindgren.

Treasurer—G. W. Stose.

Secretaries—Walter C. Mendenhall and Alfred H. Brooks.

Members of the Council—G. O. Smith, T. W. Stanton, T. Wayland Vaughan, David White and Arthur C. Spencer.

ALFRED H. BROOKS,
Secretary.

NEW YORK ACADEMY OF SCIENCES. SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

A MEETING was held November 24, Professor Farrand in the chair. Professor Lough was elected secretary of the section. Mr. J. B. Miner presented the results of some experiments on the perception of time intervals bounded by varied stimuli. Intervals of one, two, three, four and six seconds bounded by sounds, lights, or one sound and one light were given the subject, who then endeavored to reproduce the interval by taps

on a telegraph key. For intervals bounded by sounds the reproduced interval changed from plus to minus at a point between intervals of two and three seconds. There is very little difference between intervals bounded by sounds and those bounded by lights; but a considerable difference is given when the interval is bounded by a sound followed by a light or *vice versa*. The same interval bounded by varied stimuli seemed to the subjects to be longer than when bounded by like stimuli. Memory of intervals bounded by varied stimuli required more effort. Mr. Miner believed that this represented the difference in difficulty of muscular adjustment on which the memory of the time interval depended. The increase in variability with the longer intervals followed the law suggested by Cattell and Fullerton, rather than Weber's law.

Mr. Miner also read a paper by Mr. J. H. Bair, who was unable to be present, on the general practice curve. The paper was based on experiments made with a pack of 48 cards (six different pictures, and eight of each picture). The cards when dealt in the same order and then immediately after in a different order required a longer time for the second order. If dealt 2, 3, 4, 5... n times in the same order before dealing in some new order, the successive practices in the same order followed the law of the practice curve, which is an asymptotic approach to a physiological limit; and at the same time dealing the cards in any order required also less and less time. This shows that practice in one order gives practice ability in another order antagonistic to it, and the more practice in one order the greater the ability to respond quickly to the new order.

Professor MacDougal reported a series of experiments showing the influence of variations in visual stimulation upon reactions to auditory signals. Reaction time was shorter in darkness than in light, in weak light than in strong light and in colored than in neutral light. Reaction time was more constant under neutral than under colored light; changes of quality of light were followed regularly by increased rapidity of reactions.

These changes are apparently due to changes in the attentive condition of the reactor, not to any immediate organic influence of the intensity or quality of the light.

JAMES E. LOUGH,
Secretary.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

October 20, 1902.—Professor A. S. Chessin presented for publication a paper on 'Some Relations Between Bessel Functions of the First and of the Second Kind.'

Professor Wm. Trelease exhibited photographs showing the variations in the ring or collar of *Lepiota naucinoides*, and a series of lantern slides illustrating autumnal coloring of foliage.

November 3, 1902.—Mr. G. G. Hedgcock gave an illustrated account of 'The Sugar Beet Industry in the United States and Some of the Difficulties attending It.'

Five persons were elected to active membership.

November 17, 1902.—Dr. M. A. Goldstein addressed the Academy on 'The Uses of the Tuning Fork as a Means of Medical Diagnosis.'

One person was elected to active membership.

December 1, 1902.—Dr. Adolf Alt delivered an address on the 'Development of the Eye,' illustrated by colored drawings and stereopticon views made from sections prepared and photographed by him.

December 15, 1902.—A paper by C. F. Baker, entitled 'A Revision of American Siphonaptera,' was presented and read by title.

Dr. C. B. Curtis delivered an illustrated address on 'Color Photography,' outlining the theory of color vision and the various ways in which a given color sensation can be produced, and describing the processes by which the natural colors of objects can be approximately reproduced by photographic means.

Two persons were elected to active membership.

January 5, 1903.—The reports of officers for the year 1902 were received, and the following officers for 1903 installed:

President—Henry W. Eliot.

First Vice-President—D. S. H. Smith.

Second Vice-President—Wm. K. Bixby.

Recording Secretary—Wm. Trelease.

Corresponding Secretary—Ernest P. Olshausen.

Treasurer—Enno Sander.

Librarian—G. Hambach.

Curators—G. Hambach, Julius Hurter, A. H. Timmerman.

Directors—F. E. Nipher, Adolf Alt.

Mr. Julius Hurter presented a paper entitled 'A Contribution to the Herpetology of Missouri,' illustrated by specimens of nineteen reptiles not included in his former paper on the same subject, and bringing the total thus far recorded for the state up to ninety-three.

Dr. Hermann von Schrenk presented some notes on the bitter-rot disease of apples, referring particularly to recent investigations and cultural experiments. He exhibited specimens of the cankers formed on apple limbs by the bitter-rot fungus (*Glaeosporium fructigenum* Berk.) in various orchards, and of the artificial cankers produced in apple trees at the Missouri Botanical Garden by inoculating branches with spores from apples affected with the bitter-rot disease, and spores from pure cultures of the fungus from cankers occurring naturally in the orchard. Cultures showing the perfect or ascus stage of the fungus were exhibited, and attention was called to the fact that up to date the perfect form had been found only in cultures and on several apples kept in the laboratory. He announced the discovery two weeks ago, by Mr. Perley Spaulding, of the perithecia and perfectly formed asci and ascospores of the bitter-rot fungus in several of the cankers produced on apple limbs from pure cultures of the bitter-rot fungus, as well as from bitter-rot spores taken from cankers obtained in an affected orchard. This discovery is considered extremely important, as it demonstrates for the first time, beyond question, that the bitter-rot fungus actually produces its perfect fruit in the cankers, and thereby strengthens the contention that the cankers on apple limbs are actually formed by the bitter-rot fungus. The asci are apparently as evanescent in the cankers as they are in the cul-

tures, and it is, therefore, not at all improbable that many of the supposed pycnidial spores found in both the natural and artificially produced cankers were really ascospores. Drawings were exhibited showing the perithecia found in the cankers with asci and ascospores.

Two persons were elected to active membership.

WILLIAM TRELEASE,
Recording Secretary.

* TORONTO ASTRONOMICAL SOCIETY.

DURING the November and December sessions of this society, W. F. King, Government Astronomer at Ottawa, contributed a paper dealing with the general outlook of 'Astronomy in Canada.' A detailed description was given of the new government observatory at Ottawa, which was now nearing completion, and its equipment. The instruments being set up were said to be of superior excellence, the optical parts of the large telescope and most of the other instruments being the work of John A. Brashear, of Allegheny, Pa. Mr. King was quite sanguine of the future of the institution under his control.

C. A. Chant, M.A., Ph.D., first vice-president, contributed a paper dealing with 'New Developments in Wireless Telegraphy,' with special reference to the labors of Marconi. Upwards of fifty lantern slides were shown, illustrating the development of method and apparatus used from Hertz to Braun of Strassburg, Professor Slaby of Berlin and Professor Fessenden, late of the U. S. Weather Bureau, up to November, 1902. Reference was made to the desirability of knowing the precise nature of the office rendered by the ether in originating and transmitting these electric waves or shocks, and also the nature of the oscillations about the aerial wire, and its earth connection, in order to give a solid scientific basis for further practical developments of the system. Dr. Chant has been doing some original work of value along these lines. The result of some of this work will be found elaborated in the forthcoming number of the *American Journal of Science*.

Under the heading 'Vagaries of the Mariner's Compass' Arthur Harvey, F.R.S.C.,

was able to show, from curves of magnetic variation based on the records of the magnetic observatory, an apparent variation of the rate of motion of the north magnetic pole.

J. R. COLLINS,
Secretary.

TORONTO, December 23, 1902.

DISCUSSION AND CORRESPONDENCE.

GUESSES ON THE RELATIVE WEIGHTS OF BILLS AND COINS.

THE question raised in SCIENCE for November 7 as to whether women are capable of making closer estimates than men is an interesting one, but the comparison of results from different colleges is somewhat uncertain. Some of the errors can be eliminated by testing young men and young women from the same state who have always been educated together. The question 'How many one-dollar bills will equal in weight a five-dollar gold piece?' was asked of 76 male and 58 female students of the University of Wyoming with the following results:

Male students: Average guess, 391; median, 56; average variation from the average guess, 516; average variation from the median, 366.

Female students: Average guess, 1,324; median, 50; average variation from the average guess, 2,125; average variation from the median, 1,299.

Since the true number is 7, the guesses of the women are slightly better if we take the median, but the most noticeable point is the much greater variety in the guesses of the women, which is in accordance with the report of Mr. Messenger in SCIENCE for April 25. This agrees well with common observation. Probably most grade books of classes nearly equally divided between the two sexes would show that the highest and lowest marks were given to women.

In the West coin is usually preferred to paper and five-dollar gold pieces are more common than one-dollar bills in Wyoming.

E. E. SLOSSON.

UNIVERSITY OF WYOMING.

THE PUBLICATION OF REJECTED NAMES.

WITHIN the last few days I have received two papers in which rejected manuscript names are published in such a way as to render them valid, as I understand the rules. As there is evidently a misconception or divergence of opinion, it is worth while to discuss these cases.

1. Mr. Nathan Banks, in his most interesting paper on the 'Arachnida of the Galapagos Islands' (*Proc. Wash. Ac. Sci.*, 1902), cites on p. 50 *Filistrata oceanea* and *Loxoceles galapagoensis* Marx MS., n. spp. On p. 51 he states that these were *nomina nuda*, but that they are identical with his species of the same genera described below. On p. 55 the *Filistrata* is described as *F. fasciata*, and the *Loxoceles* as *L. longipalpis*. It is evident that the Marxian names have 'priority of place,' and it is clearly stated that they pertain to the two species described; it seems to me, therefore, that they are valid.

2. Mr. F. H. Knowlton (*Bull. Torr. Bot. Club*, November, 1902, p. 640) gives an account of a fossil fruit from Vermont which he says Lesquereux named in manuscript *Carya globulosa*. A description of the fruit immediately follows the publication of this name; but on the next page we are told that the fruit belongs to *Cucumites*, and 'in view of the fact that *Carya globulosa* was never actually published, it may be appropriate to name it in honor of Lesquereux, who first detected it. It may be called *Cucumites lesquereuxii*.' On the contrary, *C. globulosa* was just then published, and I do not see how we can avoid calling the plant *Cucumites globulosus*.

T. D. A. COCKERELL.

E. LAS VEGAS, N. M.
December 6, 1902.

THE IROQUOIS BOOK OF RITES.

I HAVE before me the La Fort manuscript from which my old friend, Horatio Hale, took the text of the condolence song of the 'Younger Brothers.' It varies considerably from his version, partly from haste in copying, and partly because he made the spelling more consistent in some cases. The differences are mostly in the vowels, but some con-

sonants are not the same. I do not think the sense is changed, but intend to have a new translation made.

Another interesting Indian manuscript in my hands is the Mohawk version of the greater condoling songs. La Fort's is the Onondaga one used at the delivery of the wampum when the curtains are removed. The others are sung at the wayside meeting, and on the march to the council-house, in which they usually end. This version was very plainly written by Chief George Key, of the Grand River reservation, Canada. For mere convenience it is arbitrarily arranged in verses, and it has the valuable feature of a division into syllables throughout. The song with the names was written first, perhaps as being of first importance, but the remaining songs are in the order of Hale's book. There are slight variations from his version, but none of essential importance, except one. Those who have attended a condolence will remember the continual repetition of 'Ha-i-i-i,' much prolonged, and this hardly appears in his book. In the great song with names before me it is written nearly a thousand times. In the one he saw the writer may have spared himself the trouble of writing, knowing just where it should be used. The chiefs' names occur in the usual order, but some of those placed together in Mr. Hale's version are separated in this. The variations in sense are very slight.

The greater songs are always used in the Mohawk version, as this is better adapted to the music used. This music I hope soon to secure.

W. M. BEAUCHAMP.

204 MAPLE ST., SYRACUSE,
November 19, 1902.

SHORTER ARTICLES.

THE TORTUGAS, FLORIDA, AS A STATION FOR RESEARCH IN BIOLOGY.

THE Tortugas, Florida, probably surpasses any other situation in the tropical Atlantic, in the richness of its marine fauna and in natural advantages for the study of tropical life. Until within recent years, however, the inaccessibility of the islands rendered it difficult to maintain even a temporary station

upon them, and all of our knowledge of the life of the region is due to the cursory visits of the United States government expeditions in the *Bibb*, 1869; *Blake*, 1877-78, and *Albatross*, 1885-86, as well as to the explorations of Louis Agassiz, 1850-51, and Alexander Agassiz, 1881.

Certain assistants of Alexander Agassiz have also studied the fauna of the Tortugas, and several expeditions not under government control have visited the reefs, notably that of the University of Iowa under C. C. Nutting, in 1893. The latest expedition to the islands was that of the Museum of the Brooklyn Institute of Arts and Sciences in 1902, the results of which have not yet been published.

Since 1898 the United States government has established a naval coaling station upon the Tortugas, and frequent and regular communication with Key West is now maintained by means of a large ocean-going tug. The region has thus recently become accessible, and the time for the establishment of a research station upon the islands is now ripe.

The Tortugas group is composed of seven low, sandy islands and numerous reef flats irregularly disposed so as to partially enclose a lagoon about ten miles long and six miles wide, and having an average depth of about eight fathoms.

Two of the islands are inhabited, Garden Key being occupied by Fort Jefferson, and Loggerhead Key by the Tortugas Lighthouse.

The group is the most recent of the Florida reefs. Pure, deep ocean water surrounds them, and there are none of the extensive mud flats or mangrove-covered shores so characteristic of the keys along the mainland coast of Florida. The northern edge of the Gulf Stream lies about twenty-five or thirty miles south of the Tortugas, and the east to southeast breezes, which prevail during the spring and summer, drift the surface waters of the Gulf Stream upon the Tortugas, giving a remarkable opportunity to study the life of the great tropical ocean current, while at the same time enjoying all of the advantages of a land station, a combination of advantageous conditions which all who have been upon cruising expeditions will appreciate.

Not one of the pelagic animals which abound at the Tortugas has been found living permanently north of Cape Cod, Massachusetts, although a large number of Tortugas species are annually drifted upon the southern coast of New England by the prevailing southerly winds of the summer months. The pelagic fauna of the Tortugas is, on the other hand, closely related to that of the Fiji Islands, both in the nature of the specimens themselves and in the relative abundance of characteristic forms, although slight specific distinctions can usually be perceived which separate the Tortugas from the Fijian forms.

About ten square miles of shallow reef flats lie around the Tortugas Islands and these support a fauna which, for variety and abundance, appears to be unsurpassed by that of any other situation in the Atlantic.

The Madreporaria, however, are poorly represented in the Tortugas, but previous to 1878 the coral reef was remarkable for both the number and variety of species represented. In October of that year a dark-colored water, coming apparently from the mainland of Florida, drifted out over the Tortugas reefs, killing great numbers of marine animals. Practically all of the stocks of *Madrepora murciata* were killed at this time, and this coral is still extremely rare at the Tortugas, only a few stocks being found at depths of two fathoms or more. The genera *Porites*, *Orbicella* and *Meandrina*, on the other hand, appear to have survived in considerable numbers, for many heads of these corals are now seen, all being far too large to have been formed since 1878.

As a result of one month's collecting in shallow water, it appears that about 265 species of marine animals are very abundant in water less than one fathom in depth, while a far greater number of forms are rare, or found in deeper water.

Several species of gulls nest upon the islands during the summer months, about four thousand of them annually visiting Bird Key late in April and remaining to attend their young until the third week in August. These gulls are the noddy (*Anous stolidus*), the sooty tern (*Sterna fuliginosa*), the least tern

(*S. antillarum*). The man-of-war hawk (*Fregata aquila*), and the Booby (*Sula sula*) are summer visitors. Marine turtles, especially the loggerhead (*Thalasseochelys caretta*), were once abundant upon the Tortugas, but are now becoming rare, owing to indiscriminate and constant persecution. A few females still crawl up on the sandy beaches from between the middle of May and the first week in August and dig their nests near the line of the bushes above the reach of the spray. The eggs hatch in about six weeks and the young crawl immediately into the water.

The surface hauls obtained in the Tortugas appear to be richer than those gathered in the Bahama Islands, and this is what we should expect from the prevailing winds which constantly drift the surface waters of the Gulf Stream upon the Tortugas, whereas the Bahama Islands lie to the windward of the great current, which, as every one knows, teems with pelagic life drawn into it from all parts of the tropical Atlantic.

During the summer months the temperature of the air rarely exceeds 95° F. The humidity is very high, however, although the nights are cool, and the gentle breeze drifting almost constantly over the islands renders it possible to retain normal health and energy.

The accommodations at the Tortugas consist in the officers' quarters and barracks at Fort Jefferson, the now deserted quarantine hospital on Bird Key, and the buildings attached to the lighthouse on Loggerhead Key. Officers of the United States government have, upon all occasions, displayed commendable interest in the labors of scientific men at the Tortugas, and have always granted to well-qualified persons the privilege of living within the government buildings. Indeed, our knowledge of the Tortugas fauna is almost wholly due to the efforts of the government in forwarding research in this region, and to the private efforts of Alexander Agassiz. Were a permanent laboratory to be established upon the Tortugas, however, a comfortable, well-ventilated wooden building capable of accommodating from six to twelve investigators would be required. This should

be provided with a windmill to furnish running salt water for aquaria and a tank to retain rain water. The laboratory proper should be a large, well-ventilated wooden building having a good north light. No better room has yet been devised than that of the Newport laboratory designed by Alexander Agassiz, although the ventilation of a tropical laboratory should be provided for with special care.

A small working library and sleeping rooms should be attached to the laboratory, and the kitchen and alcohol storage sheds should be in small separate buildings. Six thousand dollars would be required to construct the laboratory and its accessory buildings.

A seaworthy launch at least 55 feet in length and of light draft would be required. This should be provided with sails, auxiliary naphtha for power, and sounding and dredging reels. Such a launch is necessary, in order to study the life of the Gulf Stream itself and of numerous reefs at the Tortugas and its neighborhood. It should be capable of making the journey to and fro between Miami or Havana and the Tortugas.

The time has come when American men of science should awaken to the fact that we have at our very door a tropical fauna far surpassing in richness that of Naples. With our great wealth and many able and energetic workers, we should begin to perform the task for science which is being so ably done at Naples. The great monographs of the Naples Laboratory should be our incentive to do even more and better things in the development of knowledge concerning the marine life of tropical America.

ALFRED GOLDSBOROUGH MAYER.

MUSEUM OF THE BROOKLYN INSTITUTE OF
ARTS AND SCIENCES.

EGG-LAYING IN GONIONEMUS.

In a preliminary report on the life-history of *Gonionemus* (*Jour. Morph.*, Vol. XI., p. 494) I stated that the cause of deposition of eggs was due to the withdrawal of light, as the animals could be induced to deposit the eggs almost any time of day by placing them in the dark for an hour. The next year

(1896) some experiments were made with colored light to find if egg-laying could be brought about in more than one way and thus get nearer the cause. As I was not able to continue these experiments and some one else may be in position to do so, I give the substance of a few notes made at the time and the conclusion. The medusæ were exposed in a blackened box, one end of which was closed with a sheet of the desired color glass.

First some medusæ were exposed to yellow-orange light for one hour. The sun was not shining into the box; no eggs were deposited. These were then exposed for one hour to blue light (cobalt glass) and eggs were deposited; they were abnormally slow in segmentation. Next some of the animals were exposed under darker orange glass for two hours and no eggs were deposited. This and a control set were then put in the dark for one hour and in both cases eggs were deposited normally. Two females and a male were exposed under blue glass for one hour. The sun was shining through the glass and it was, therefore, lighter than in the other exposure under the blue. No eggs were deposited within the hour.

Sixteen females and one male were exposed under dark ruby glass for one hour and ten minutes, the sun shining through the glass; no eggs were deposited. In two other trials under the ruby glass when the sun did not shine into the box eggs were deposited. Immediately after the first exposure to red, above, the animals were placed under blue glass and left for one hour and fifteen minutes, and still no eggs were deposited. It took over one and one half hours' exposure to darkness before extrusion took place. Whether the previous exposure to ruby light had a retarding effect or not was not determined. The conclusion drawn was that the colors were not effective as such, but merely as they obstructed the light. It was also found at that time that the gonads removed from the animal deposit the sex products just as well as the intact animal.

L. MURBACH.

DETROIT, MICH.

MILEY'S PROCESS OF COLOR PHOTOGRAPHY.

FOR two years or so Mr. Miley, a photographer of Lexington, Va., has been using a process of color photography which seems to present distinct advantages over any process heretofore devised, and which promises to make color photography a complete success. Mr. Miley is a skilled photographer, and has spent much of his time in experimentation, often with no little success. His process of color photography is the outcome of some of these experiments, and can not be considered as a development of any of the other processes in use, none of which has such practical possibilities. Mr. Miley has made and sold many of these color photographs during the past two years, while he has, at the same time, been experimenting to improve the process. It is only recently that he has been prevailed upon to take out patents. A paper on Mr. Miley's work was read before the Chemical Section at the recent meeting of the American Association in Washington by Professor W. G. Brown, and specimens of the work in its various stages were exhibited, and I am permitted to give a description of his process to the readers of SCIENCE.

Negatives are prepared by the tri-color process, using three sensitized plates and three screens, red, green and violet, respectively. For the red screen an orthochromatic plate, flowed with a cyanin solution, is used; for the green screen an orthochromatic plate, and for the violet screen a plain gelatine bromid plate. There are thus obtained three negatives, varying in density in the different areas according to the color values of the three primary colors in the corresponding areas of the object taken.

Prints are made from these negatives by the use of bichromatized gelatine pigment paper (carbon tissue). The pigment papers used are red, yellow and blue. The blue paper is printed from the red screen negative, the red paper from the green screen negative, and the yellow paper from the violet screen negative. These three printed films are then superposed upon transfer paper, the result being a color photograph, imitating the colors of the object with a marvelous degree of

fidelity. This process has been used to copy oil paintings, which will probably in the future be its greatest value, as well as to reproduce flowers and fruit in their natural colors. To obtain most accurate results great care and much experience are necessary. In Mr. Miley's hands the process seems exceedingly simple. The points along which experience is most necessary, and along which also improvements may be made, seem to be the following: choice of screens so as to give the full color value of the object; corresponding choice of pigment papers to match the effects of the screens; choice in time of exposure through the different screens, so as to attain the true color value of the object; density of printing films; order of superposition of films.

While great improvements will be made in the future, the process itself can no longer be considered in its experimental stage, as it has now been in commercial use for upwards of two years. It constitutes one of the greatest advances in the history of photography.

JAS. LEWIS HOWE.

CURRENT NOTES ON PHYSIOGRAPHY.

PHYSIOGRAPHIC DIVISIONS OF KANSAS.

AN essay by G. I. Adams under the above title indicates the salient characteristics of several natural areas, and illustrates their boundaries on a map (*Bull. Amer. Geogr. Soc.*, XXXIV., 1902, 89-104). One here finds good illustration of the value and aid of physiographic explanation as a means of geographic description; the reason for this being that the relief of the state is on the whole moderate, and the elements of form hardly pass beyond the range of plain, hill, escarpment and valley, so that empirical description is baffling and confusing. The divisions proposed are all based on structure as modified by erosion and deposition. Cherokee lowland, a subsequent lowland twenty-five miles wide, crossing the southeastern corner of the state from Missouri to Oklahoma, is generally worn down to low relief on a belt of weak coal measures, but preserves occasional sandstone mounds on the divides; its streams flow in wide, flat-bottomed valleys bordered by low gentle slopes, the whole area

being 'practically down to grade.' The Osage prairies, lying next west, present a series of ragged, east-facing rock-terraces and outliers; the sinuous retreating escarpment of resistant limestones and sandstones, between which the weaker strata are worn to fainter relief. To the north, this area is blanketed with old drift, now dissected sufficiently to reveal patches of the underlying rocks. South of the center of the state is the Great Bend lowland, an extensive plain, more or less mantled with sands, close to the level of the Arkansas river, which flows through it; the plain has been eroded on weak shales, and is bordered by uplands of harder rocks. After several other areas, the High plains of the western third of the state close the essay; this division of the Great plains is described as still largely of constructional origin, its valleys being relatively small furrows when compared with the great extent of level upland remaining between them.

It is in this western and semi-arid part of Kansas that the summer traveler from rainier lands is surprised to recognize the rivers in the distance by the clouds of sand blown up from their dry channels: a peculiarity which has suggested the remark that 'one seldom sees rivers whose beds are so well aired as those of the Great plains.'

THE ALPS IN THE ICE AGE.

'Die Alpen im Eiszeitalter,' by Penck and Brückner, of which four parts have now appeared (Leipzig, Tauchnitz, 1901-2, 432 pp., many illustrations), promises to be a thorough and trustworthy monograph. The most notable characteristic of the work, as far as it is now published, is the admirably broad basis of fact upon which its generalized inductions are based. Many of these are of physiographic import. It is shown, for example, in the section on the northeastern Alps that the larger valleys repeatedly present a systematic succession of features for which glacial erosion and deposition are taken as the cause. These features are impressed upon a region which in preglacial time is believed on good reasons to have been a mountain mass of rounded forms, whose valleys opened north-

ward upon a piedmont peneplain. Most important among the glacial features are the cirques of the valley heads, by whose excavation the subdued preglacial mountain masses were given sharp peaks and arêtes (as shown by Richter); the over-deepened main-valley troughs, with over-steepened lower side-walls and with discordant or hanging side-valleys; moraine-walled basins near where the over-deepened valleys broaden and open on the piedmont plain; groups of drumlins inside of the moraines, and extensive sheets of gravel, now more or less terraced, outside of the moraines. The repeated examples of these features, described, illustrated and mapped as occurring in orderly fashion in one valley system after another, are most instructive and convincing. Those who desire to review the work of ancient glaciers in the Alps can not do better than provide themselves with this excellent monograph as a guide for a fortnight's excursion in one of the valleys of the Tyrol.

It should be noted that these authors, and others of the same mind, have been led to conclude that large glaciers of strong slope deeply erode their valleys, not because of the discovery of any new facts regarding the erosive action of existing glaciers, but because of the unanimous testimony to this conclusion by the witnesses of glacial action in the past. Regions of extinct glaciers are unanimous in testifying to the repeated occurrence and systematic distribution of the features above named in their larger valley systems, while non-glaciated regions are equally unanimous in testifying to their absence. At the same time, well-grounded generalizations as to the normal development of valley systems by rain and rivers exclude Alpine cirques, over-deepened main valleys and hanging lateral valleys, basins, drumlins and moraines from among the possible features of such systems; while generalizations as to the modification of normal valley systems by temporary glacial action, on the assumption of active glacial erosion, logically demand the occurrence of precisely such features. Little wonder then that the theory of strong glacial erosion has found increasing

acceptance in recent years, since the unanimity of these many witnesses and the cogency of these generalizations have been recognized.

GLACIERS AS CONSERVATIVE AGENTS.

LEST the opinion in favor of strong glacial erosion should go too far, it is well to give special attention to such articles as explain by other processes the particular relation of over-deepened main valleys and hanging side valleys, to which so much prominence has recently been given in this connection. Bouney, writing on 'Alpine Valleys in Relation to Glaciers' (*Quart. Journ. Geol. Soc.*, LVIII, 1902, 600-702), recognizes the prevalently discordant relation of trunk and branch valley in certain parts of the Alps, but concludes, on the basis of 'personal examination of every part of the Alps, of the Pyrenees, the Apennines, Scandinavia, Auvergne, and many other hill and mountain regions,' that cirques are mainly the work of water; and that in a system of valleys, denudation would, on the whole, be checked where glaciers occupied the higher tributaries, and intensified by the action of torrents in the principal valleys. Garwood, discussing the 'Origin of Some Hanging Valleys in the Alps and Himalayas' (*Ibid.*, 703-715), also concludes that glaciers protect their floors. He explains certain striking examples of discordance between trunk and branch valleys in the Alps as the result of the accelerated erosion of the trunk valley on account of the steepening of its stream by a tilting of the region, while the side valleys, at right angles to the direction of tilting are not cut down, because their streams are not tilted. Kilian presents some 'Notes pour servir à la géomorphologie des Alpes dauphinoises' (*La Géographie*, VI, 1902, 17-26), and insists that the hanging lateral valleys of that district have been protected by glaciers while the main valleys have been deepened by normal stream work. Lugeon adduces the occurrence of rock sills that rise across certain Alpine valley floors, notably a sill known as the Kirchet in the Aar valley above Meiringen, and a similar sill in the Rhone valley below Martigny, to

prove that the ancient glaciers were not destructive agents; had they been, these sills ought to have been removed; their presence is a 'peremptory argument against the deepening of valleys by glaciers' ('Sur la fréquence dans les Alpes de gorges épigénétiques et sur l'existence de barres calcaires de quelques vallées suisses,' *Bull. labor. de géol.*, Univ. de Lausanne, No. 2, 1901, 34 pp., excellent plates). This author takes no account of the hanging lateral valleys which are so abundantly associated with the main valleys of the Aar and the Rhone, and therefore naturally enough gives much importance to the rock sills, which in the theory of strong glacial erosion are explained as residual hard-rock inequalities in a much-deepened valley floor.

The manifest difficulty in the way of explaining hanging lateral valleys by the conservative action of the glaciers that once occupied them is the necessity of assuming a systematic and persistent termination of many independent glaciers at the mouths of lateral valleys, for a period long enough to allow the main stream to deepen its valley by hundreds and to widen it by thousands of feet. The difficulty in the way of accounting for over-deepened main valleys by tilting, as suggested by Garwood, is that in the plentiful examples of tilted and therefore dissected districts in non-glaciated regions, the side streams cut down the side valleys about as fast as the main stream cuts down the main valley, and by the time the main valley is well opened the side valleys enter it at grade, in most accordant fashion. W. M. DAVIS.

THE MISSOURI BOTANICAL GARDEN.

FROM advance sheets of the administrative report on the Missouri Botanical Garden, presented at the recent annual meeting of the Trustees, it appears that the gross revenue for the year was \$124,431.89 and the total expenditure \$119,893.84, of which \$25,352.64 was spent for the maintenance of the garden proper and \$8,186.46 for improvements and extensions in this department; \$3,015.81 for the herbarium; \$6,595.40 for the library; \$5,086.67 for administrative expenses at the

garden; \$1,075.81 for research; \$2,874.78 for publication; \$1,121.96 for the training of garden pupils (in addition to the allotment which those holding scholarships receive and which is offset by their services in the garden); \$2,480.93 in carrying out bequests made by the founder of the garden; and the remainder for expenses connected with the administration and maintenance of revenue property.

In connection with a popular account of the garden, written by the director at the request of the editor of the *Popular Science Monthly* and published in the January number of that magazine, it is interesting to note that a net gain of 1584 species or varieties cultivated at the garden was made in 1902, bringing the total up to 11,551; 21,052 more persons visited the garden in 1902 than ever before recorded, bringing the total up to 112,314 for the year; the herbarium, which now includes 427,797 specimens valued at \$64,169.55, was increased by the incorporation of 62,844 specimens; the library, which now includes 41,224 books and pamphlets valued at \$67,506.30, was increased by the addition of 2,516 books and 2,696 pamphlets; and the current list of serial publications received at the library has been brought up to 1,160.

The effort which the administration of the garden is making to serve the three principal purposes of Henry Shaw in founding the garden, is evident from the expenditures above recorded for the maintenance of a beautiful and instructive garden; by the expenditure for the instruction of garden pupils and the support—within the provisions of Mr. Shaw's will—of the Henry Shaw School of Botany, of Washington University, in which, in addition to undergraduates, one candidate for the Master's degree and four for the Doctor's degree in botany are said to be registered; and by the expenditures for research and the publication of the results of research noted above, and the mention in the report of extensive field study undertaken by the director in connection with a revision of the Yuccas and related plants, published in the volume issued last summer.

SCIENTIFIC NOTES AND NEWS.

DISPATCHES from Edinburgh report that in furtherance of his educational scheme for Scotland Mr. Andrew Carnegie has decided to endow a trust for scientific research with a fund of \$5,000,000.

A MEETING of the executive committee of the Carnegie Institution was held at Washington on January 24. Appropriations were made exhausting the \$200,000 allotted by the trustees for grants. All the research assistants have not, however, yet been appointed, and those who wish to be considered in this connection should apply in accordance with the notice published in the issue of *SCIENCE* for January 9.

DR. W. A. CANNON, A.B. (Stanford University, 1899): A.M., 1900, Ph.D. (Columbia University, 1902), has been appointed resident investigator of the Desert Botanical Laboratory of the Carnegie Institution. Mr. Frederick V. Coville and Dr. D. T. MacDougal, of the advisory board of the laboratory, started on January 24 on a tour of inspection of the region west of the Pecos River in Texas, along the Mexican boundary, for the purpose of fixing upon a location for the laboratory.

KING OSCAR of Sweden and Norway has conferred the Norwegian medal 'for merit' on M. Berthelot, the eminent French chemist.

THE Norman medal of the American Society of Civil Engineers has been awarded to Professor Gardner S. Williams, of Cornell University, for a paper entitled 'Experiments upon the Effect of Curvature on the Flow of Water in Pipes.'

THE board of control of the Naval Institute has awarded the gold medal and prize to Professor P. R. Alger, U.S.N., for his essay on 'Gunnery in the Navy; Causes of its Inferiority and its Remedy.'

THE Rumford Committee of the American Academy of Arts and Sciences has made the following grants in aid of investigations in light and heat: To Dr. Ralph S. Minor, of Little Falls, N. Y., \$250 for a research on the dispersion and absorption of substances for ultra-violet radiation; to Dr. Sidney D.

Townley, of Berkeley, Cal., \$100 for the construction of a stellar photometer of a type devised by Professor E. C. Pickering and already in use in the study of the light of variable stars; to Professor Edwin B. Frost, \$200 for the construction of a special lens for use in connection with the stellar spectrograph of the Yerkes Observatory to aid in the study of the radial velocities of faint stars; to Professors E. F. Nichols and G. F. Hull, of Dartmouth College, \$250 for their research on the relative motion of the earth and the ether; to Professor George E. Hale, of the Yerkes Observatory, \$300 for the purchase of a Rowland concave grating to be used in the photographic study of the spectra of the brightest stars.

DR. NICHOLAS SENN, of Rush Medical College, University of Chicago, is making an extended trip through the West Indies and South America.

DR. WHERRY, of the department of bacteriology of the University of Chicago, has been appointed pathologist in the Government Municipal Health Laboratory in the Philippine Islands.

FROM the first of January, Mr. James Gurney, for nearly forty years head gardener at the Missouri Botanical Garden, retires from active service with the title of gardener emeritus, in which capacity he will continue the experimental breeding of decorative plants, in which field he has attained considerable success.

DR. MARCELLIN BOULE has been named to succeed M. Albert Gaudry as professor of paleontology in the Paris Museum of Natural History.

THE appointment by the council of Mr. W. L. Slater as secretary of the Zoological Society of London appears to have caused a good deal of discussion and may not be confirmed by the fellows. In addition to this appointment it is understood that Mr. W. E. de Winton has been appointed to the new and temporary office of acting superintendent of the gardens with a view to considering questions affecting their reorganization.

THE Pathological Society of Philadelphia held a symposium on snake venom at the meet-

ing on January 22. The speakers announced were Drs. Weir Mitchell, Flexner, Naguchi, Kinyoun and MacFarland. Dr. Welch, of Johns Hopkins University, opened the discussion.

DR. H. M. SMITH, of the U. S. Commission of Fish and Fisheries, delivered an illustrated lecture before the Geographical Society of Baltimore on the evening of January 20, the subject being 'How the Government maintains the Fish Supply.'

MR. ROBERT T. HILL, of the U. S. Geological Survey, who visited Martinique as representative of the National Geographic Society, and whose preliminary reports upon the St. Pierre disaster have been published in the *National Geographic Magazine*, *The Century*, *Collier's Weekly* and the daily press, is engaged upon a careful study of the scientific aspects of the eruptions and he hopes to present his views on the subject during the coming year. He is also completing a monograph on the Windward Islands for Professor A. Agassiz to be published by the Museum of Comparative Zoology of Harvard College. This work will be the result of several years of careful study of the islands and will thoroughly discuss the details of their geological structure and their bearing upon the alleged Windward Bridge and the myths of Atlantis. Mr. Hill is also busily engaged upon an extensive monograph on the Trans Pecos province of the Rocky Mountain region, which he hopes to have completed during the coming year. He has also in hand a large comprehensive geographical work upon the Republic of Mexico. From this country, where he has been gathering notes for the past fifteen years, he has just returned, after a most interesting mule-back trip across the southern end of the Sierra Madre between Mexico City and Acapulco. During the coming spring, he proposes to make a section of the Eastern Sierra Madre of Mexico, to revisit Martinique, and to spend the late summer in Europe for the purpose of continuing his comparative studies of the European and American Cretaceous faunas.

THE Entomological Society of Washington has passed resolutions as follows:

Resolved, That the Entomological Society of Washington herewith expresses its keen appreciation of the great loss American science, and particularly American preventive medicine, has sustained in the death of Major Walter Reed, Surgeon U. S. Army. Although not a zoologist, he has been preeminent among physicians in making practical application of zoologic knowledge in saving human life, and his discovery and demonstration of the transmission of yellow fever by mosquitoes belonging to the species *Stegomyia fasciata* must take rank scientifically as one of the most brilliant, and practically as one of the most important discoveries ever made in applied zoology.

Resolved, also, That we heartily endorse the idea that Congress be urged to make ample provision for the support of Doctor Reed's widow and daughter. Had Doctor Reed been in private practice or on the faculty of the medical school of an endowed university, his income would have been much larger than that he received in the Army. Had he discovered some mechanical device which could in any way compare in importance, in saving lives and property, with the discovery he made in regard to yellow fever, he would have realized financial benefits which would have made him a multimillionaire, and even if Congress should vote an unusually generous pension, the sum could represent only an infinitesimal interest on the money which Doctor Reed's medico-zoological discovery will save this country and other countries.

Resolved, further, That this Society express to Mrs. Reed its sympathy in her bereavement.

Committee: CH. WARDELL STILES.

L. O. HOWARD.

W. H. ASHMEAD.

PROFESSOR ESTEVAN ANTONIO FUERTES, a distinguished civil engineer, and for many years head of the College of Civil Engineering at Cornell University, died on January 23. He had been a member of the faculty since 1873 until last November, when he retired on account of failing health. Born at San Juan, Porto Rico, on May 10, 1838, he was employed from 1861 to 1863 in the public works department of Porto Rico. He came to this country in 1863 as assistant engineer of the Croton Aqueduct Board, of which he was engineer from 1864 to 1869. He was engineer-in-chief of the ship canal expedition which the United States government sent to Tehuantepec and Nicaragua in 1870. After two years in New York city as a consulting engineer he became dean of the department (now college) of civil engineering at Cornell.

THE death is announced of M. Gruéy, director of the observatory at Besançon. He has bequeathed his fortune to the observatory.

THE Rev. Henry W. Watson, D.Sc., F.R.S., for nearly forty years rector of Berkswell, died on January 11, aged seventy-five years. He was educated at King's College, London and Trinity College, Cambridge, where he became a fellow. He was subsequently mathematical lecturer at King's College and master at Harrow School. He is known as the author of numerous books and articles on mathematical and physical subjects, the latter being concerned with the kinetic theory of gases, electricity, magnetism, etc.

MR. JAMES WINSHURST, F.R.S., known for his work in electricity died on January 3, aged seventy years.

M. PIERRE LAFITTE died on January 4 in his eightieth year. M. Lafitte had been since 1893 professor of a chair created at that time in the Collège de France for the history of science, on which subject he had long lectured, in the rooms formerly occupied by Comte whose disciple he was.

WE regret also to record the deaths of Dr. Albert Hénocque, assistant director of the laboratory of biological physics at the Collège de France, and of Dr. Max Schrader, professor of surgery at Bonn, and Dr. Panas Photinov, professor of surgery at the Paris Faculty of Medicine and formerly president of the Academy of Medicine.

THE Civil Service Commission will hold on March 3 and 4 an examination for the position of aid in zoology in the National Museum and on March 10 an examination for the position of aid in herpetology. The salaries of these positions are \$60 and \$50 a month respectively.

THE Information Committee of the Engineers' Club, of Philadelphia, has arranged for an excursion to New York City on Saturday, February 7, leaving Broad Street Station on the 7:33 A.M. train. The trip will be made without expense to the members. After an inspection of the plant of the Barber Asphalt Company at Long Island City, it is proposed to visit the New York Subway, now in course

of construction, returning to Philadelphia in time to attend the regular meeting of the Club.

MR. ANDREW CARNEGIE has offered to the College of Physicians in Philadelphia \$50,000 for the maintenance of its library, conditioned upon the college raising \$50,000 more. Of this sum Mr. F. W. Vanderbilt has given \$10,000 and Mr. Clement A. Griscom \$5,000.

THE will of the late Dr. Bushrod W. James bequeaths to the city of Philadelphia a property on Mount Vernon street, all his instruments and office appliances, and \$55,000 for the maintenance of 'an institution for the examination, treatment and operation of eye, ear, nose, throat, cardiac and pulmonary diseases.' His books and an endowment of \$40,000 are given for the support of a free library.

The Electrical World states that the Municipal Council, of Paris, France, has voted \$600 for the creation of a bureau of scientific information for foreigners. Many foreign scientific men annually visit Paris for inquiry and study in holiday times, when heads of museums, collections and libraries are away. A competent linguist has now been appointed to reply to inquiries, verbally or in writing.

THE *Scotia* of the Scottish National Antarctic Expedition arrived at the Falkland Islands on January 6.

THE New York Association of Biology Teachers will meet in the Board of Education building, 59th Street and Park Avenue, on Friday, January 30, at 8:15 P.M. The subject for the evening is 'The Public Scientific Institutions and the School System,' which will be discussed by Dr. H. C. Bumpus, director American Museum Natural History; Dr. N. L. Britton, director-in-chief New York Botanical Gardens; Dr. C. H. Townsend, director New York Aquarium, and Dr. A. G. Mayer, curator Division of Natural Science, Brooklyn Museum. The members of the Association will be glad to welcome to this meeting all teachers and school officers who are interested in the progress of nature study, as well as those whose chief concern is with high school biology.

THE national convention of delegates from the various State Boards of Health, called to

consider the danger threatened by the possible introduction of the bubonic plague into the United States, was held in Washington on January 19. Resolutions were adopted stating that the presence of the plague in San Francisco has been established beyond doubt and blaming severely the gross neglect of official duty by the State Board of Health of California, the obstructive influence of the recent governor of California and the failure of the city government of San Francisco to support its city Board of Health.

NEW information regarding the coal, gas, and oil fields of western Pennsylvania, which was obtained last summer by the U. S. Geological Survey, through Mr. R. W. Stone, in cooperation with the state of Pennsylvania, is soon to be made public by the government in the form of a new geologic map, which will form a part of the Waynesburg geologic folio. The folio will include, also, descriptive text. The map will embrace a section 13 by 17 miles in eastern Greene County, and will be based upon a topographic map previously issued by the same survey, showing in detail the surface features of the region. The geologic map will be of special importance in showing the outcrops of the workable coal beds of the quadrangle. One of its most prominent features will be the representation of the geologic structure of the region by contour lines drawn on the floor of the Pittsburg coal. These contours show that the strata have been thrown into broad folds which cross the territory in a northeast-southwest direction. Since the accumulation of oil and gas is directly influenced by such structures, their accurate representation is of the greatest importance to operators searching for the productive territory. The most important fold in the quadrangle is known as the Waynesburg anticline. Upon the crest and western flank of this arch is located the Waynesburg gas field, which is one of the most important producers in western Pennsylvania. Future demands for bituminous coal will probably cause shafts to be sunk to the Pittsburg seam in many parts of this territory, in which case the structural features as shown on this map will be of great value in determining the location of such

shafts and in indicating the depth below the surface at which the coal will probably be found.

UNIVERSITY AND EDUCATIONAL NEWS.

MR. FREDERICK W. VANDERBILT, of New York, has announced his intention of giving to Yale University another dormitory for the Sheffield Scientific School. Ground has just been broken for the first dormitory, which will be completed in June, 1904, and will contain fifty rooms providing for seventy-five students.

WELLESLEY COLLEGE is to have, through the generosity of Mr. John D. Rockefeller, a new power plant. Apparatus will be installed for heating all the buildings on the college grounds, which extend over several acres, and the grounds will be lighted by electricity.

MR. EDGAR L. MARSTON, of New York, has founded a new scholarship at Brown University, to which he has given \$5,000. The income is to be available annually for any graduate of the high school in St. Louis who may be recommended by the principal.

MR. FREDERICK JAS. QUICK, of Eltham and Trinity Hall, Cambridge, and of the firm of Messrs. Quick, Reek & Smith, 148 Fenchurch Street, London, E. C., has left his residuary estate to the University of Cambridge in trust, to apply the income in promoting the study of vegetable and animal biology, for which purpose the University will probably eventually receive between £50,000 and £60,000.

THE corner stone was laid for the new Library Building of the University of Colorado at Boulder on January 17. The central portion will be ready for occupancy on July 1, 1903. The total cost of the structure will be about \$160,000.

A CONFERENCE in regard to the Rhodes Scholarships of Oxford University, representing the educational interests of Massachusetts, Connecticut and Rhode Island, was held at Harvard University on January 24. Dr. Parkin presented fully the conditions. The chief subject of discussion appears to have been at what stage in education the scholar should proceed to Oxford. Committees were

appointed in each of the three states to take charge of the subject.

THE college entrance board is preparing its spring announcement, which will show that its work is to be considerably extended this year. Examinations have already been arranged for in eighty-six different centers in this country and Europe. Among other places, examinations will be held in Hawaii, at Ponce and San Juan in Porto Rico, London, Paris, Strassburg and Dresden. The examiners in the sciences are:

Botany—William F. Ganong, Smith College; Byron D. Halsted, Rutgers College; Edward L. Morris, Central High School, Washington, D. C.

Physics—Edward L. Nichols, Cornell; W. S. Franklin, Lehigh; Frank Rollins, Morris High School.

Chemistry—Henry P. Talbot, Massachusetts Institute of Technology; Leverett Mears, Williams College; Albert C. Hale, Brooklyn.

Geography—Albert P. Brigham, Colgate University; William N. Rice, Wesleyan; Frank Carney, Ithaca, N. Y.

Mathematics—Charlotte A. Scott, Bryn Mawr College; William H. Metzler, Syracuse University; John S. French, Port Deposit, Ind.

REV. LANGDON C. STEWARDSON, professor of philosophy and chaplain of Lehigh University, has been chosen president of Hobart College, Geneva, N. Y.

PROFESSOR G. N. STEWART, M.D., Ph.D., professor of physiology in Western Reserve University Medical School of Cleveland, has been appointed professor and head of the department of physiology at the University of Chicago, to fill the vacancy caused by the removal of Dr. Jacques Loeb to the University of California.

DR. EDWARD C. FRANKLIN, professor of physical chemistry in the University of Kansas, has been elected to the associate professorship of organic chemistry, in Stanford University.

DR. EDWARD P. BUCHNER, of Clark University, Worcester, Mass., formerly professor in the School of Pedagogy of New York University, has been appointed to the chair of pedagogy in the University of Alabama, vacated by the death of Professor Jacob Forney.